A WEED CONTROL SOURCE UNIT

by

ALLAN CHARLES ELSTROM 265

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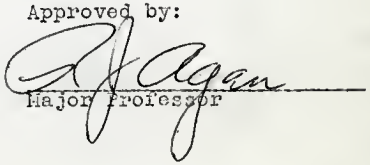

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INTRODUCTION

INTRODUCTION

The author of this report, having had thirty-five hours in the area of agronomy and having completed three years of teaching vocational agriculture at the time of this study, felt there was a need for a weed control source unit for vocational agricultural teachers to use in teaching weed control.

The author of this report felt that in 1968, education was needed by students preparing to farm as well as farmers already farming if they were to have an understanding of their ever-increasingly complex and technical occupation. He also felt that these students and farmers needed more knowledge if they were to increase their farming efficiency so they could maintain a living on their ever-narrowing margin of profit. He further believed that students preparing to farm were realizing that they needed more education to be able to enter and progress satisfactorily in the area of farming.

The purpose of this study was to develop a weed control source unit in prepared lessons for vocational agricultural teachers to use in teaching weed control. The author of this report felt that vocational agricultural teachers who would use this source unit in teaching weed control could greatly benefit the students and farmers receiving the information.

Statement of the Problem

The purpose of this study was (1) to provide Kansas vocational agricultural teachers with a source unit on weed con-

trol in agronomic crops; (2) to present this information in prepared lessons that might be used by Kansas vocational agricultural teachers in teaching vocational agriculture classes and/or adult farmer classes; (3) to evaluate the effectiveness of this source unit by measuring the increase of the students' knowledge and understanding of weed control resulting from the presentation of the lessons by testing the students at the beginning and following the teaching of the source unit; (4) to compare the results of these tests with a control group that did not receive the instruction.

Review of Selected Literature

As a preliminary step to developing this study, a search of the related literature was made in the Kansas State University Library, in the Agronomy Library in Waters Hall at Kansas State University, and in the personal library of the author of this report. In addition to surveying the above mentioned libraries, interviews were held with various specialists in the state of Kansas to gather background information. The following were interviewed: Dr. L. E. Anderson, Professor of Agronomy, Kansas State University; Dr. Kurt Feltner, Professor of Agronomy, Kansas State University; Mr. Don Modlin, Weed Supervisor, Jewell County, Kansas; and Dr. Sam Unger, Agricultural Economist, Agri-Research, Manhattan, Kansas.

Selection was made from the above sources and reviewed in this report as background for the study.

More knowledge on weed control was found to be considered very important for all farmers and students preparing to farm. Crafts and Robbins stated the weed loss as follows: "Of the four groups of agricultural pests--(1) animal diseases; (2) plant diseases; (3) insects, rodents, and predatory animals; and (4) weeds--the latter may well cause the greatest losses."[1]

In 1954, the losses in agriculture were estimated in a United States Department of Agriculture bulletin. It was indicated that weeds cost $3 billion; plant diseases cost $1 billion; insect pests cost $1 billion; and animal diseases cost $250 million. According to this estimate, losses caused by weeds exceeded the combined losses of the other three sources. In fact, only soil erosion was more costly to agriculture than weeds.[2]

Still later, in 1963, it was estimated in a United States Department of Agriculture bulletin that the weed loss was $3.8 billion.[3]

In interviewing Dr. L. E. Anderson, Professor of Agronomy, Kansas State University, in 1965, the writer of this report was told that for that year, the weed loss in Kansas, based on

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[1]Alden S. Crafts and Wilfred W. Robbins, Weed Control (New York: McGraw-Hill Book Company, Inc., 1962), p. 19.

[2]B. T. Shaw, Losses in Agriculture. A Preliminary Appraisal for Review, United States Department of Agriculture, Agricultural Research Service, mimeographed report ARS-20-1.

[3]United States Department of Agriculture, A Suggested Program of Weed Research and Control, Circular 863, p. 4.

acreage, would be $132 million or $6.00 per acre of crops harvested. Weeds would cost just about $1,000 for every 160 acres of crops that were raised in Kansas.[1]

In considering the importance of weed control, it was decided that instructional material should be made available in the form of lesson plans, which might be more likely to be used by other teachers of vocational agriculture. E. M. Juergenson stated that:

> Instructional material is probably one of the oldest and most frequently discussed subjects in education. The use of instructional materials has probably influenced learning, for good or bad, as much as any facet of education. While instructional materials can make a teacher better, they are not substitutes for teaching or teachers. They can serve to spread the teacher's influence to more students or to wider areas.
>
> What constitutes instructional materials? The best answer may be anything utilized in teaching. The entire gamut of resource material used to assist a teacher in guiding the learning process could probably be classified as instructional material.[2]

Julian M. Campbell said:

> The Vocational Education Act of 1963 provides vocational education with a new stimulus--a new springboard for action. It provides for more flexibility and for broader objectives. At the same time it brings additional problems such as: What should be taught? How should it be taught?[3]

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[1]Dr. L. E. Anderson, Professor of Agronomy, Kansas State University, Manhattan, Kansas, 1965.

[2]Dr. E. M. Juergenson, "Instructional Materials and the Teacher," Agricultural Education, Volume 40, Number 11, May, 1968, p. 243.

[3]Julian M. Campbell, "Implementing Research in Agricultural Education," Agricultural Education, Volume 40, Number 9, March, 1968, p. 197.

The author of this report felt that a source unit on weed control that was written in lesson plans would not only provide what should be taught, but also show some vocational agricultural teachers how it could be taught.

Phipps and Cook in their handbook stated:

> A source unit is an extensive collection of teaching materials that may be used in developing a short-time teaching plan. A good source unit contains more ideas than should be used at any one time with a class.[1]

The above authors also indicated that a source unit, besides containing a lot of information, should also be accumulative in nature. New materials should be added as new ideas and information become available. As the teacher gains experience and secures new methods of teaching, the source unit should contain an up-to-date condensed source of information for teaching a major unit.

Robert V. Kerwood said:

> Teachers of vocational agriculture should submit new ideas, or innovations, to be field tested for application to teaching vocational agriculture. An example of this would be a new teaching method which has stimulated unusual learning. It could be further tested, evaluated, and the results disseminated to other schools.[2]

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[1]Lloyd J. Phipps and Glen Charles Cook, Handbook on Teaching Vocational Agriculture (Danville, Illinois: The Interstate, 1956), p. 172.

[2]Robert V. Kerwood, "Using Research in Teaching," Agricultural Education, Volume 40, Number 9, March, 1968, p. 200.

It is the wish of the author that this source unit be made available to other teachers of vocational agriculture.

Hammonds stated that:

> Teachers of agriculture should use the results from research as a basis for their teaching whenever such results are available and applicable to the situation. Persons who lack respect for research should not teach agriculture.[1]

For these purposes, a weed control source unit was constructed. It was developed and tested by similarly following the procedures and techniques of Nelson Galle's master's report, "A Source Unit on Swine Production and Management."[2]

This source unit was presented with the hope that it would fulfill the need of a weed control source unit for Kansas vocational agricultural teachers. It was also presented to help anyone who received this instruction by increasing their knowledge and understanding of weed control, which in turn might help them to produce crops more efficiently.

Definitions of Terms Used

Certain terms were set aside for special definitions as they applied to this study. They may or may not have been those of common usage.

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[1]Carsie Hammonds, Teaching Agriculture (New York: McGraw-Hill Book Company, Inc., 1950), p. 68.

[2]Dale Nelson Galle, "A Source Unit on Swine Production and Management" (unpublished master's report, Kansas State University, Manhattan, Kansas, 1964).

Weed control. Science of suppressing or hindering a plant out of place to prevent seed production, and to prevent spreading of the plant with procedures that enable the farmer to produce a profitable crop in spite of weeds.

Agronomic crops. For the purposes of this study, agronomic crops was interpreted as wheat, sorghum, corn, soybeans, and alfalfa.

Source unit. For the purposes of this study, a source unit was interpreted as a collection of subject material pertaining to weed control and presented in lessons that could serve as a short-time teaching plan for Kansas vocational agricultural teachers in teaching vocational agriculture classes and/or adult farmer classes.

Vocational agricultural teacher. Any person certified to teach vocational agriculture in Kansas.

Adult farmer class. Any post-high school class organized by a vocational agricultural teacher for the purpose of studying and learning about agriculture.

Procedure

The main purpose of this study was to evaluate source material and develop a weed control source unit for agronomic crops in prepared lessons that might be used by vocational agricultural teachers in preparing and teaching lessons on weed control. Another purpose of this study was to evaluate the effectiveness of the source unit.

A source unit, for the purposes of this study, was interpreted as a collection of subject material pertaining to weed control and presented in lessons that could serve as a short-time teaching plan for Kansas vocational agricultural teachers in teaching vocational agriculture classes and/or adult farmer classes. The source unit was designed to contain more information than most vocational agricultural teachers would want to use in one class. The source unit was also designed to be accumulative in nature, with new materials being added as new ideas and information became available.

The research design utilized in this master's study was "Creative Research and Experimental Research". It was classified as creative because it consisted of the designing of a new course. In applying and obtaining results on this source unit, a "parallel group experimental" research procedure was used. It was classified in this manner because both a control group and an experimental group were used in obtaining the results. In developing this study, the following procedures were used:

1. Names of specific weeds, consisting of the Kansas noxious weeds and others considered veryharmful in agronomic crops, were obtained by interviewing Dr. L. E. Anderson, Professor of Agronomy, Kansas State University. These were used as a guideline to help keep the weed control source unit practical. The names of weeds obtained from interviewing are listed in the appendix.

2. Information for developing this source unit was obtained from technical publications, text books, magazines, and by interviews. Information was found in the Kansas State University Library, in the Agronomy Library in Waters Hall at Kansas State University, and in the personal library of the author of this report. In addition to surveying the above mentioned libraries, interviews were held with various specialists in the state of Kansas to gather background information. The following were interviewed: Dr. L. E. Anderson, Professor of Agronomy, Kansas State University; Dr. Kurt Feltner, Professor of Agronomy, Kansas State University; Mr. Don Modlin, Weed Supervisor, Jewell County, Kansas; and Dr. Sam Unger, Agricultural Economist, Agri-Research, Manhattan, Kansas.
3. The above material and interviews were reviewed. Selections from the material and interviews were made on their potential usefulness in helping Kansas vocational agricultural teachers teach lessons on weed control.
4. A tentative source unit was developed. It contained information in the following areas:
   (a) Introduction and Importance of Weed Control
   (b) Classification and Identification of Weeds
   (c) Review Identification of Weeds and Field Trip
   (d) Cultural Weed Control

(e) Laws Pertaining to Weed Control

(f) Introduction to Weed Chemicals

(g) Built-In Protection of Chemicals and Chemical Safety

(h) Chemical Weed Control in Wheat

(i) Chemical Weed Control in Sorghum and Corn

(j) Chemical Weed Control in Legumes (Alfalfa and Soybeans)

(k) Field Chemical Applicators and Sprayer Adjustments

(l) Introduction to Herbicide Combinations

(m) Herbicide Combinations for Agronomic Crops

(n) Recognizing Herbicide Injury

(o) Herbicide Toxicity

(p) Biological Weed Control

(q) Computerized Weed Control for Corn and Soybeans

(r) Field Trip to Weed Supervisor's Office and an Experiment Station

5. The tentative source unit was submitted to an advisory committee of two specialists. One was Dr. R. J. Agan, Professor of Agricultural Education, Kansas State University, who reviewed the source unit from the standpoint of its organization and its value in meeting the needs of vocational agricultural teachers; the other was Dr. Kurt Feltner, Professor of Agronomy, Kansas State University, who reviewed the source unit from the standpoint of its technical information.

6. The source unit was then revised on the basis of suggestions made by the advisory committee.
7. A multiple choice 100 question test, based on the material in the source unit, was developed. This examination was reviewed by three specialists. One was Dr. R. J. Agan, Professor of Agricultural Education, Kansas State University, who reviewed the examination from the standpoint of its organization; one was Dr. Kurt Feltner, Professor of Agronomy, Kansas State University, who reviewed the examination from the standpoint of its technical information; one was Mr. Don Modlin, Weed Supervisor from Jewell County, Kansas, who reviewed the examination from the standpoint of its practicality in pertaining to weed control. No major revisions were made from the tentative examination.

A purpose of this study was to evaluate the effectiveness of the source unit. The usefulness of the material in the source unit was evaluated by a comparison of pre-test and post-test scores taken in connection with the teaching of lessons from the unit to Jewell High School vocational agriculture students. These students were divided into two groups. The freshmen and seniors were the control group and the sophomores and juniors were the experimental group.

It was assumed for the purposes of this study that the grouping was equal in that the variables of one group was

canceled out by the variables of the other group. The intelligence quotient (IQ) scores were not available for the freshmen. It was found that the average intelligence quotient in the sophomore class was 105. In the junior class, the average intelligence quotient was 104. In the senior class, the average intelligence quotient was 105.

All students were given the pre-examination on April 22, 1968, before any lessons on weed control were taught from the source unit. Their scores on this examination were recorded after the post-test was given.

The lessons in this source unit were taught to the experimental group of vocational agriculture students in Jewell High School from April 23, 1968, to May 14, 1968, for a total of fifteen days.

The same examination on weed control was re-administered to all the vocational agriculture students on May 15, 1968. The results of this examination were recorded.

The comparison of results of the pre-examination and the follow-up examination was analyzed. The students that received instruction and those that did not receive instruction based on the lessons in the source unit were compared.

Limitations of the Study

This study was limited to a total of twenty-nine vocational agriculture students at Jewell High School who participated in the study. Eleven freshmen and five seniors, totaling

sixteen students, did not have instruction based on the source unit. Their test scores were compared to the five sophomores and eight juniors, totaling thirteen students, that received instruction based on the source unit.

The study was further limited in that the information presented in the source unit applied only to Kansas. Also, the report was limited because it was taught to students in one high school by one vocational agricultural teacher.

The results were limited in that conclusions found after testing applied only to the test which was developed by the author.

Variables which may have affected the accuracy of the data were:

1. It was assumed that all the students had received no advance notice and did not prepare for the pre-test.
2. It was assumed that all the students had an equal interest in learning about weed control.
3. It was assumed that there was no outside of class discussion about the pre-test or post-test.
4. It was assumed that the freshmen in the control group had the same average mental ability as the other students.
5. It was assumed that the students in the control group had the same average experiences and knowledge of weed control as the students in the test group before the pre-test was given.

WEED CONTROL SOURCE UNIT

SUGGESTED OBJECTIVES TO BE DEVELOPED DURING TEACHING

The author of this report felt that during the teaching of the source unit the following suggested objectives might be developed. A vocational agricultural teacher might wish to add to, subtract from, or change these suggested objectives.

1. To develop an interest and understanding of the vocational agriculture class and/or adult farmer class.
    a. To develop objectives and acquaint students and/or farmers with the objectives of the weed classification and control course of study.
    b. To promote an interest and understanding of the importance of weeds and weed control.
2. To provide each student with some responsibility for furnishing information to the class to provide a feeling of belonging to the group.
3. To increase students' and/or farmers' knowledge and understanding of the study of weed control so they may utilize this knowledge to develop techniques of controlling weeds which will help them to become more efficient.
    a. To recognize and identify weeds.
    b. To adopt approved practices of wood control.
    c. To provide an understanding of the various types of chemicals used in weed control.
    d. To develop a plan of weed control for their farm.
    e. To develop an awareness of and preparedness for the changes taking place in the science of weed control.

4. To develop new skills by helping do them in class. (Learning by doing.)
5. To become better acquainted with laws that portain to weed control.
6. To become better acquainted with the weed supervisor and the purposes and techniques of his department.
7. To become better acquainted with state and United States Departmont of Agriculture publications and learn how they may be obtained.
8. To stimulate interest in other agricultural chemicals such as fertilizers, insecticides, and fungicides.
9. To develop an awareness of other problems and to learn where holpful information can be obtained.

Introduction and Importance of Weed Control

ENTERPRISE: Weed Control

REFERENCES:
1. Weed Control by Crafts and Robbins
2. Film "Watch Out for Witchweed"
3. Weed control notes

PROBLEM: What is the importance of weed control?

OBJECTIVES:
1. To promote an interest in and an understanding of the importance of weeds and weed control.
2. To develop and acquaint everyone in the course with the objectives of the weed classification and control course of study.

MOTIVATION: What could you do if someone handed you $1,000 to spend any way you wanted to?

DISCUSSION QUESTIONS

1. What is a weed?

   a. A weed is a plant out of place.
   b. It is also a plant that does more harm than good.
   c. It is a plant that interferes with the production of a crop.
   d. It is also defined as a plant whose attributes have not yet been discovered.

2. How much are we paying to let our weeds compete with our crops?

   a. The weed loss in the United States has been estimated at five billion dollars a year or 104 million dollars average for each state.
   b. The loss in Kansas, based on acreage, would be 132 million dollars or $6.00 per acre of crops harvested, or just about $1,000 for every 160 acres of crops that we raise. Think what uses you could find for all that money.
   c. The weed loss has been compared with other agricultural pests. Of the four agricultural pests, weeds caused the greatest loss.
      (1) Weeds--$3,000,000,000.00 lost.
      (2) Plant diseases--$1,000,000,000.00 lost.
      (3) Insect pests--$1,000,000,000.00 lost.
      (4) Animal diseases--$250,000,000.00 lost.

d. According to those estimates, losses caused by weeds exceeded the combined losses of the other three sources. In fact, only soil erosion is more costly to agriculture than weeds.

3. What do weeds do to cause these losses?

a. Compete with crops, which decreases yields.
   (1) Moisture
   (2) Nutrients
   (3) Light
b. Reduce crop quality.
c. Harbor insects and plant diseases.
d. Increase irrigation costs.
e. Injure livestock.
f. Lower value of land.
g. Last, but not least, is how weeds affect us.
   (1) Hay fever--ragweed and goldenrod.
   (2) Skin irritations--poison ivy.
   (3) Morale--like when we see weeds taking over our gardens.

4. Why are weeds a significant problem?

a. Weeds can grow just about anywhere.
b. Weeds produce many more seeds per plant than do crops. A study in North Dakota showed that 181 species of weeds produced an average of 21,000 seeds per plant compared to 100-1,000 seeds per plant with field crops.
c. Weed seeds have more vitality than crop seeds. Some live 30-40 years.

5. How do weeds spread?

a. Livestock.
b. Birds.
c. Wind.
d. Water--float on irrigation ditches.
e. Man

6. What is the weed's best disseminator?

a. Man is a weed's best disseminator. In fact, every noxious weed in Kansas has been brought in by man.
b. Does anyone know the story of how bindweed found its way to Kansas? Bindweed is not a native of the United States. It is a native of Europe. About 1848, it had been brought over and was found growing in Massachusetts and Pennsylvania. It seems that some Mennonites decided to move west. They brought with them some Turkey wheat and settled at Newton. They

planted their Turkey wheat and this is how bindweed started in Kansas. By 1870, bindweed was found near San Francisco. It had spread across a continent in fifty years. Nobody tried to stop it or control it. In this example, we see the two most important basic principles of weed control.

7. What is weed control?

   a. It is the process of suppressing and limiting weed infestations.

8. What are the two basic principles of weed control?

   a. To prevent seed production.
   b. To prevent the weed from being spread by man.

9. How many weeds has man introduced into the United States?

   a. There are about 500 species of weeds introduced by man.
   b. Weeds are still being introduced into the United States by man.

10. The following film, "Watch out for Witchweed", depicts what can happen when we introduce a new weed and what is being done to stop it. The film illustrates the problem of weeds and some approved practices being used to fight the weed. It brings to mind some of the laws that pertain to weed control and the importance of weed control. It also helps show the responsibilities of all farmers to work together in weed control, if some weed is to be controlled. Witchweed has not gotten to Kansas yet; but unless it can be stopped, it may soon thrive wherever corn grows.

11. Show film, "Watch out for Witchweed".

Classification and Identification of Weeds

ENTERPRISE: Weed Control

REFERENCES:
1. Weed Control by Crafts and Robbins
2. "Weeds of the North Central States"
3. Weed control notes

PROBLEM: How are weeds classified and how can they be identified?

OBJECTIVE: To gain better understanding of how weeds are classified and identified so the controlling practices may be applied.

MOTIVATION: Hold up a mount of kochia and a mount of field bindweed. Weeds may be classified as annuals, biennials, or perennials. What are these and how would they be classified? Before we can solve a problem, regardless of what the problom is, wo need some information or insight into the problem. Since our over-all problem is one of controlling weeds, we must have some information about the weed itself such as life cycle and root systems.

DISCUSSION QUESTIONS

1. What are the characteristics of annuals, biennials, and perennials?

   a. Annuals--Live one season and reproduce by seed each year. Similar to corn and sorghum.
      (1) Summer annuals--Begin growth in spring, produce seed and die in fall. Examples: kochia, pigweeds, foxtails.
      (2) Winter annuals--Begin growth in fall and go through winter in vegetative stage, produce seed before fall and die. Similar to wheat. Examples: downy brome, cheat, treacle mustard.
   b. Biennials--Grow through two growing seasons and reproduce during second season. Examples: musk thistle and most of the thistles, wild carrot.
   c. Perennials--Live several years and produce seeds too. Perennials are also classified by the types of root systems they have.

(1) Simple perennials--Have a taproot which does not spread. Spread only by seeds. Similar to alfalfa. Examples: curly dock, bush morning glories, dandelions.
(2) Bulbous perennials--Reproduce by bulblets and seed. Example: wild onion.
(3) Rhizomatous perennials--Reproduce by seed and buds found in each segment or node of the root. Example: Johnsongrass.
(4) Creeping perennials--Reproduce by roots and seeds. Examples: field bindweed, climbing milkweed, spreading dogbane.

2. What types of weeds are our worst problems and why?

a. Annuals--Because of the number of seeds produced.
b. Creeping perennials--Because they are good competitors and are spread by roots as well as seeds. Difficult to control by cultivation.
c. Rhizomatous perennials--Because they are good competitors. Because of buds on each root section, they are easily spread by cultivation instead of controlled.

3. Weeds are also classified as introduced and indigenous or native. Which are our worst problems and why?

a. Introduced--Worst problem because they are brought into a new area where their natural controlling agents are not found.
b. Indigenous (native)--Through the years, natural enemies have developed to somewhat keep these in check. Examples: prickly pear, buckbrush, and sumac.

4. What are two types of weeds?

a. Grassy weeds
b. Broadleaf weeds

5. What are the classifications of weeds according to how difficult they are to control?

a. Common weeds--Includes annuals, biennials, and perennials that can usually be controlled by ordinary practices.
b. Restricted noxious--More difficult to control. They are given this classification by the state legislature and are listed in the Kansas Seed Law.

c. Prohibited noxious--All of those are perennials and are hard to control. These too are classified by the state legislature and are listed in the Kansas Seed Law. Those are the ones defined by the Kansas Noxious Weed Law.

6. What are the prohibited noxious weeds and their identifying characteristics? (Flash pictures of weeds on screen as they are discussed.)

a. Field bindweed
   (1) Leaves--arrowhead shape.
   (2) Flowers--small, white to pink, two small bracts one-half to one inch below flowers.
   (3) Seed--three angled, coarsely roughened, dark gray-brown.

b. Hoary cress
   (1) Seed--seed pod on plant has a style (beard) on it, seed is egg-shaped with a rough reddish-brown surface.
   (2) Leaves--hairy.

c. Russian knapweed
   (1) Seed cluster on plant like pineapple.
   (2) Seed--is shaped like sunflower seed only smaller and white.

d. Johnsongrass
   (1) Head--similar to sudangrass except color is more purplish.
   (2) Seed--glumes are attached to seed, seed is usually more purplish than sudangrass, seed has fine hairs on it, rachillae are knobbed.

e. Canada thistle
   (1) Leaves--crinkled edges and spiney margins, bottom of leaves are hairy.
   (2) Flowers--small lavender flowers, less than three-fourths inch in diameter and no spines on flower heads.
   (3) Seed--smooth, oblong with a slight taper toward one end which can be curved or straight, light to dark brown.

f. Nodding thistle
   (1) Plant--large plant with large lavender flowers.

g. Leafy spurge
   (1) Plant--very leafy.
   (2) Seed--oval, smooth, light gray to dark brown.

h. Indian rushpea
   (1) Leaves--similar to a pea vine.

i. Quackgrass
   (1) Head--spike type, spikelets (seeds) are flat with the flat side against the stem.

(2) Seed--edges of seed are not curled like cheat, short awn (beard) is attached at the tip end of the seed.

j. Goatgrass
(1) Jointed grass.

k. Bur ragweed
(1) Ragweed type leaves but with burs that resemble sandburs.

7. What other method could be used to identify a weed that is not known?

a. Hand out "Weeds of the North Central States". Turn to page 199.
b. How is this key arranged?
(1) By flower color.
c. Pass out an unfamiliar weed and use key to identify it.
d. To make sure the plant was identified correctly, turn to the page number listed by the name and check it by the picture and description of the plant.

8. Where can "Weeds of the North Central States" be obtained?

a. From a county extension agent for $0.75.

9. Why is it important to be sure the weed is identified correctly?

a. Weeds must be identified correctly if the proper control method is to be applied.
b. Many herbicides are extremely specific in their action, controlling only one or a few specific weeds.

10. Plan on field trip for next class meeting.

Review Identification of Weeds and Field Trip

ENTERPRISE: Weed Control

PROBLEM: What weeds are our worst problems here?

OBJECTIVE: To become better acquainted with the names of weeds and their classifications, so the correct controlling practices may be used.

MOTIVATION: I see several of you brought some weeds. Hold them up to the class and tell us where you found them. Can anyone identify them? (Pass out "Weeds of the North Central States." Have each group work on a weed.)

DISCUSSION QUESTIONS

1. Which classifications do the weeds you are looking at come under?

    a. Annuals, biennials, perennials, introduced, indigenous, grassy, broadleaf, herbaceous, woody, common, restricted noxious, or prohibited noxious.

2. Shall we try to classify the weeds on the field trip besides identifying them?

3. On our field trip, let's make a list of the weeds we consider the most troublesome in this area, and what crops they are the most troublesome in. Would anyone like to make the list?

* * *

When the field trip is over, meet back in class for a summary. Put the list on the board and discuss it, adding other weeds that are considered troublesome that we didn't see.

Cultural Weed Control

ENTERPRISE: Weed Control

REFERENCES: 1. Weed Control by Crafts and Robbins
2. Weed control notes

PROBLEM: What are the cultural methods of controlling weeds?

OBJECTIVE: To gain an understanding of the cultural methods and to adopt recommended practices in farming operations.

MOTIVATION: I have put the list of weeds on the board which we compiled last time. In this list, there seems to be a common occurrence of an association of crops with certain weeds.

DISCUSSION QUESTIONS

1. What are some of the factors that make an association of crops with certain weeds?

   a. Similarity of seed size.
   b. Time of ripening and germination.
   c. Various tillage, cropping, and harvest practices.

2. In other words, we have this crop-weed association because the weed has a life cycle similar to the crop. To control these weeds, we need to apply the two basic principles of weed control. What are these?

   a. Prevent seed production.
   b. Prevent it from spreading to new areas.

3. What is the most obvious practice that will help to control weeds in a crop-weed association?

   a. Follow a desirable rotation of crops.
   b. May use summer fallowing too. (Kill weeds before they seed.)

4. Since some weeds are associated with certain crops, what practices would help to prevent these weeds from getting started?

   a. Plant clean seed.
      (1) Purchase certified seed, tested and labeled according to the Kansas Seed Law.
      (2) Clean seed with a fanning mill.

b. Avoid using weed-infested feed, manure, and machinery.
   (1) Livestock feeding on weed-infested feed will spread seeds through manure.
   (2) Farm machinery should be cleaned before use in a clean field, if it was used in a weed-infested field.

5. Cultivation can be a good cultural method of weed control if used correctly. How do the methods and use of cultivation differ in controlling annuals, biennials, and perennials?

   a. Annuals--prevent seed production
      (1) Control when young.
      (2) Cultivate often enough to prevent seed production.
      (3) Shallow cultivation is recommended.
   b. Biennials--prevent seed production and deplete carbohydrates from roots.
      (1) Control when young.
      (2) Cultivate when plant has grown for three weeks.
      (3) Cultivate deeply to kill first year.
   c. Perennials--prevent seed production and deplete carbohydrates from roots.
      (1) Control when young (seedlings).
      (2) Cultivate before plant is three weeks old.
      (3) Cultivate deeply to control in two years.

6. What are the recommended cultivation practices to control field bindweed?

   a. Deplete root system of carbohydrates.
      (1) Cultivate three to five inches deep at intervals of 14 to 18 days, but let plant grow from 5 to 10 days before cultivating it.
      (2) Cultivate when carbohydrates are low in May and July.
      (3) Cultivate for two years.
   b. May use tillage and cropping system.
      (1) Wheat--harvest--plow.
      (2) Cultivate every 2-3 weeks as necessary.
      (3) Cultivate as late as possible (middle of October).
      (4) Plant wheat.
      (5) Follow this system for 3 to 4 years.

7. What are other cultural practices that may be used to prevent seed production and to prevent spreading of weeds?

   a. Mowing--before plant sets seed (Canada thistle).
   b. Burning--flame cultivation--equipment is expensive.
   c. Flooding--local areas.
   d. Grazing--weaken root system (Johnsongrass).

8. What is biological control of weeds?

   a. Introduce an insect or disease that will control specific weeds.
      (1) Colorado potato beetle will control buffalobur and horse nettle.
   b. Rachel Carson's book, "Silent Spring," recommends further research in biological control of weeds--no chemical residue problem.

SUMMARY

Practices we should adopt:
1. Practice crop rotation.
2. Plant clean seed.
3. Clean farm machinery before using in clean field.
4. Follow recommended cultivation practices.
5. Control field bindweed by using a cultivation and cropping system.

Laws Pertaining to Weed Control

ENTERPRISE: Weed Control

REFERENCES:
1. "Kansas Noxious Weed Law" (Appendix E)
2. "Kansas Seed Law" (Appendix E)
3. "Kansas Chemical Spray Law" (Appendix E)
4. Weed Control by Crafts and Robbins
5. Weed control notes

PROBLEM: What use are the weed laws to me?

OBJECTIVE: To become familiar with the weed laws and how they may benefit us in controlling weeds.

MOTIVATION: If you have a neighbor that has bindweed growing next to your land, is there any law that says he must control it? Is there any law that affects owners or operators of spraying equipment?

DISCUSSION QUESTIONS

1. What are the purposes of having weed laws?
   a. To prevent new infestations
      (1) From other countries
      (2) From one state to another
      (3) From one farm to another
   b. In other words, to keep man from spreading weeds.
   c. Weed laws are for the benefit and protection of the farmer.
      (1) Help to control weeds as well as preventing them from being spread.
      (2) Aid farmers financially.
2. Hand out the "Kansas Noxious Weed Law".
3. What is the "Kansas Noxious Weed Law"?
   a. Law that was set up in 1937 under the Noxious Weed Division of the Kansas State Board of Agriculture.
   b. Defines the noxious weeds of Kansas and gives approved practices for controlling these. (See page 2, section 2-1314.)

c. Page 3 gives duties of the weed supervisors. (Sec. 2-1316)
d. Page 6 gives costs of chemicals. (Sec. 2-1319)
e. Also on page 6, it tells how to handle your neighbor that doesn't control his noxious weeds. (Sec. 2-1320)
f. Page 8 and page 9 give the laws that make it unlawful to spread weeds. (Sec. 2-1325 through sec. 2-1329)
g. Sec. 2-1330 on page 9 gives permission to the weed supervisor to enter your property and inspect it for noxious weeds.

4. How is a noxious weed added to the list?

   a. State legislature votes to have it added.

5. How does a chemical (herbicide) get on the approved chemical list?

   a. Tested on experiment plots usually at one of the experiment stations. Most are tested at Hays.
   b. If found to be good for 3 years, it may become approved.
   c. The chemical and results are written up and signed by the director of the experiment station, and sent to the secretary of the Kansas State Board of Agriculture.
   d. The secretary sends it to the head of the Noxious Weed Committee, Kansas State Board of Agriculture.
   e. If chemical is found to be at least as good as recommended, it may be added to list at next printing.
   f. All approved chemicals are listed in the publication, "The Kansas Noxious Weed Law".

6. What practical use is the "Kansas Noxious Weed Law" to me?

   a. Gives best approved practices available for controlling these weeds.
      (1) Best approved cultural methods.
      (2) Best chemical methods of control.
         (a) Time
         (b) Rate
         (c) Method of application

7. Hand out the "Kansas Seed Law".

8. What is the "Kansas Seed Law"?

   a. Law that was set up in 1925 under the control division of the Kansas State Board of Agriculture.
   b. Defines prohibited noxious weeds and restricted noxious weeds. (Check 10 on first page.)

c. Law deals with labeling of seed offered for sale.
d. Page 3 states what must be printed on the label of seed offered for sale. Discuss these.

9. How many know that five samples of seed can be sent to the state seed laboratory and have it tested for free?

a. Turn to seed testing, page 6.

10. Besides getting five samples tested free, what other benefit is this law to us?

a. Protects us from buying weed seeds.

11. Hand out the "Kansas Chemical Spray Law".

12. What is the "Kansas Chemical Spray Law"?

a. New law in 1963 that replaced the Kansas Aerial Spraying Law of 1955.
b. It is under Noxious Weed Division, Kansas State Department of Agriculture.
c. Every owner or operator of any spraying equipment used for commercial business must be registered with the Secretary, Noxious Weed Division.
(1) Must pay $10 for each unit.
(2) Must be bonded ($2,000 for first unit and $1,000 for every one after that).
d. The operator must keep records. (Turn to back page and go through these.)

13. Does the "Kansas Chemical Spray Law" mean that I have to register with the secretary of noxious weed division to spray for my neighbor?

a. Yes, since 1963, when it applied to all sprayer units whether aerial or ground units.

14. What is the "Federal Seed Act of 1939"?

a. Governs movement of agricultural seed into this country and also interstate.
b. Label must have origin and the seed must comply with the law of the state in which it is to be sent.

15. How does the "Federal Seed Act" help control weeds?

a. Tries to keep weeds from being spread by man.

SUMMARY

Practices we should adopt:

1. Adopt an approved method stated in the "Kansas Noxious Weed Law" to control one of the noxious weeds.
2. Send in some seed samples to state seed testing lab to have it checked for weeds every year.
3. Check label before buying seed to plant.
4. Register with noxious weed division before spraying neighbor's fields.

Introduction to Wood Chemicals

ENTERPRISE: Weed Control

REFERENCES:
1. Weed Control by Crafts and Robbins
2. Kansas Bulletin 513 "Chemical Weed Control in Crops"
3. Weed control notes

PROBLEM: What type of chemicals should I use to control weeds?

OBJECTIVE: To become more familiar with chemical types so I can use them more effectively and more safely.

MOTIVATION: What chemicals did we use this past year and to what weeds did we apply them? (List them on board as students name them.)

DISCUSSION QUESTIONS

1. What is an herbicide?

   a. A chemical used to control weeds or any undesirable plant including trees.

2. What is a granular herbicide?

   a. An herbicide that is in crystal form and is sometimes mixed with a carrier.

3. What are the different groups of herbicides?

   a. Nonselective herbicide--an herbicide that is generally toxic to all kinds of plants.
      (1) Soil sterilant--a soil herbicide that prevents growth of green plants, either temporarily or for several years.
         (a) methyl bromide--gas
         (b) sodium chlorate--salt
         (c) sodium arsenite--inorganic salt
         (d) trichlorobenzoic acid--inorganic salt
      (2) Contact herbicide or desiccant--an herbicide that kills primarily by contact with plant tissue.
         (a) pentachlorophenol
         (b) DNBP

(3) Translocated herbicide--an herbicide that moves within the plant from its entry point.

b. Selective herbicide--an herbicide that is more toxic to some plants than to others.

(1) Selective soil herbicide--an herbicide applied to the soil that kills only certain plants as they germinate.

(a) Pre-emergent herbicide--an herbicide that is selective by placement and which is applied before crop and weed emergence.

-1- atrazine
-2- propazine

(b) Post-emergent herbicide--an herbicide that is applied after emergence of a crop and/or weed.

-1- atrazine
-2- dalapon

(c) Pre-plant herbicide--an herbicide that is incorporated into soil before the crop is planted.

-1- vernolate
-2- EPTC

(2) Selective contact herbicide--an herbicide that kills only certain species on contact.

(3) Selective translocated herbicide--an herbicide that moves within certain plants from its entry point.

(a) 2,4-D
(b) MCPA
(c) 2,4,5-T

4. What are some selective herbicides that are applied as a spray or granulars that are selective for broadleaf weeds?

a. 2,4-D--controls broadleaf plants in grasses.
b. 2,4,5-T--controls brush.
c. MCPA--controls some weeds that are resistant to 2,4-D.

5. What are some selective herbicides that are applied as a spray or granulars that are selective for grasses?

a. TCA--controls grasses as well as some broadleaf weeds. Has to be applied to soil before growth starts for effectiveness.
b. dalapon--controls grasses. Best on Johnsongrass. Can be sprayed on foliage or soil to control.

6. What do we call the group of chemicals that are selective by placement?

a. Pre-emergents--herbicides applied before crop or weeds emerge.
b. Crop seed is planted deep enough that it doesn't absorb chemical, but weeds do because the weed seeds that come up are near the surface.
   (1) atrazine--corn
   (2) propazine--grain sorghum
   (3) amiben--soybeans

7. In what crops are pre-emergents mainly used?

   a. Row crops

8. What are some of the factors that affect pre-emergent effectiveness?

   a. Rate--must be enough to do job.
   b. Soil type--need soil that holds chemical toward surface. This is why some pre-emergents won't work on sandy soils. The chemical leaches down to crop seed and kills it too.
   c. Rainfall pattern--must have rain or moisture to leach it into the soil surface.
      (1) No rain--won't work very well.
      (2) Too much rain--leach down and kill crop.
   d. Solubility of chemicals
      (1) Dryer areas need high solubility chemicals.
      (2) Wet areas need low solubility chemicals.

9. There is another group of selective chemicals that are fairly new. They are called pre-plant chemicals. This group may become quite important in a few years. Has anyone heard of them? Do you know how they are used?

   a. Chemicals put on soil and mixed in before the crop is planted. May control all broadleaf weeds and grasses or certain ones, but still let the crop grow.
   b. Advantages of pre-plant chemicals.
      (1) After crop is planted, may not need to cultivate crop--minimum tillage.
      (2) Provide more time for other jobs.
   c. What are some of the pre-plant chemicals?
      (1) EPTC will control the perennial grasses, sedges, and quackgrass, but not affect the crop. Also used in corn and to control weeds in a new stand of alfalfa.
      (2) Vernolate and trifluralin used to control weeds in soybeans.

10. Why are the 2,4-D compounds unique weed killers?

a. They have several herbicidal actions.
   (1) Kill leaves by contact.
   (2) Translocated into roots of perennials to kill them.
   (3) If applied to the soil, may be absorbed by the roots of weeds and kill the weeds.
   (4) Show selective action as in controlling broadleaf weeds in cereals.

11. What factors influence effectiveness of herbicides?

a. Rate of application--very specific in many cases.
b. Time of application--must be correct time for crop, weed, and chemical.
   (1) If sprayed on weeds, must be when weed is young and growing or it won't be absorbed or translocated.
c. Rainfall--rain may leach chemical too deep or wash it off foliage.
d. Physiological factor--resistance of some plants to chemicals.
   (1) 2,4-D won't affect buffalobur.
   (2) The volatility of 2,4-D will curl tomato leaves.

12. We must read the directions on the labels of chemicals and FOLLOW DIRECTIONS.

13. Here are some chemical containers. Let's look at what they are, what weeds they control, and directions for applying.

14. How are percent active ingredients used to determine amount of chemical to apply?

a. Example: If you have a material that is 90% active and you want to apply 90 pounds per acre, how many pounds of the commercial product would you need to use?
   (1) 100 pounds
b. You need to check active ingredients before you buy. Prices may vary on the chemicals, but so may the active ingredients.
   (1) Often the highest priced material will be the cheapest when compared on an active ingredient basis.

SUMMARY

Practices we should adopt:
1. Follow directions on package of chemical.
   a. Use correct rates and not more.

2. Apply chemicals to plants at correct time, while they are young and growing.
3. Try EPTC on an acre of new alfalfa.
4. Check active ingredients and prices of chemicals to:
   a. Save money.
   b. Get correct amount to use to give correct ratos as recommended.

Built-In Protection of Chemicals and Chemical Safety

ENTERPRISE: Weed Control

REFERENCES:
1. Weed Control by Crafts and Robbins
2. Silent Spring by Rachel Carson
3. Film "Unseen Harvesters"
4. Film "Safe Use of Pesticides"
5. Weed control notes

PROBLEM: What importance is the label on the weed control chemical or other agricultural chemicals which I buy? Are chemicals as bad as illustrated in Silent Spring?

OBJECTIVES:
1. To become more familiar with techniques and development of chemicals.
2. To gain an understanding of the testing of chemicals and of the importance to us of the results obtained from the testing.
3. To realize the importance of following directions.
4. To develop awareness of practicing safety practices when using chemical compounds.
5. To give an insight into chemical development which may develop into an interest in other agricultural chemicals.

MOTIVATION: Can any of you tell us what a herbicide is? A herbicide is a chemical used to control weeds or any undesirable plant including trees. Are herbicicides safe to use? Might Du Pont put a product on the market which is found effective against a pest but which may be poisonous to us?

DISCUSSION QUESTIONS

1. When we select a herbicide, we want one that will do its job. But what are some of the other characteristics of a good herbicide?

   a. Must be effective.
   b. Must be economical.
   c. Must be easy to apply.
   d. Must be non-poisonous.

e. Should have minimum drift.
f. Should not leave soil residue problem.
g. Should not be explosive.
h. Should have good storage capabilities.
   (1) Not harden or cake.
   (2) Not lose its effectiveness.
i. Should be available.

2. Much concern has been shown lately about chemical residues left on crops and soils. "Silent Spring", by Rachel Carson, was written to condemn all agricultural chemicals. Many examples are given of the misuse of chemicals. It is true that, if misused, chemicals may leave residues or even be poisonous to the person who applies the chemical. But, when used properly, herbicides and other agricultural chemicals help man to produce a bountiful harvest. Remember that the United States is an island in a sea of hunger. True, we have surpluses, but we are one of the only countries in the world that has mechanization. Agricultural chemicals have aided us in being capable of producing enough food to feed ourselves and forty other people.

3. We have said that chemicals, if misused, may leave residues on crops or poison us when we apply them. What is our best protection against misusing chemicals, especially herbicides?

   a. Read the directions on the label.
   b. Follow the directions.

4. There are many chemicals on the market today, and, if used according to directions, they ARE safe. Have these chemicals been tested? How are chemicals tested?

   a. 98% of herbicides are produced by commercial companies.
   b. If company scientists approve a chemical, it is then sent to an agricultural experiment station to be tested.
      (1) For every one chemical that a company sends to an experiment station, 1,000 to 3,000 others are discarded.
   c. Experiment stations test chemicals for three years or more. Before being approved, the chemical must be as good or better than any other chemical.
   d. If found to be good, the chemical is sent by the company to the Pure Food and Drug Administration.
   e. The Pure Food and Drug Administration establishes residue tolerances on the chemical.
   f. Then the company gets patent rights on their product and begins to sell it.
   g. From the time the company synthesizes it until the product gets sold on the market takes 7-10 years.

5. The following film describes the development of a chemical. It shows the tests which the chemical must pass before it is put on the market. It shows the care with which the residue tolerances are established. If directions on chemicals are not followed, all the benefits of the tests and residue tolerances that are established are wasted. This film is "Unseen Harvesters", by Du Pont. The unseen harvesters are the chemists. See if you can figure out what chemical is being developed as you watch the film.

6. Show film, "Unseen Harvesters".

7. What chemical was developed?

   a. It was monuron--a substituted urea. Trade name is Telvar.
   b. As shown, it is used for truck crops and cotton crops.

8. The following film sums up the importance of following the label on a chemical. The film title is "Safe Use of Pesticides".

9. Show film, "Safe Use of Pesticides".

10. Once upon a time there was a busy man named Mr. Loser. He studied and learned many things, but he had no time for safety. But neither does anyone else. One morning he took several swallows of what he thought was cough medicine, from a bottle easily within reach in the medicine cabinet. Alas, it turned out to be carbon tetrachloride. This man's last words to his wife were, "But I thought..."

    Do you have time for safety or are you a Mr. Loser?

Chemical Weed Control in Wheat

ENTERPRISE: Weed Control

REFERENCES:
1. Weed Control by Crafts and Robbins
2. "The Kansas Noxious Weed Law"
3. Bulletin 513 "Chemical Weed Control in Crops--1968"
4. Weed control notes

PROBLEM: What chemicals can I use to control weeds in wheat?

OBJECTIVE: To become more familiar with chemicals used in controlling weeds in wheat so I can control weeds in my wheat.

MOTIVATION: What chemical can be used to spray a field of wheat? Where can we get information on what chemicals may be usod in crops? "Chemical Weed Control in Crops."

DISCUSSION QUESTIONS

1. On page 4 in "Chemical Weed Control in Crops," what are the recommended rates of application of 2,4-D?

   a. One-fourth to one-third per acre of ester form.
   b. One-half to two-thirds lb. per acre of amine salt form.

2. When should 2,4-D be applied to wheat?

   a. From fully tillered to early boot stage.

3. When should 2,4-D <u>not</u> be applied to wheat?

   a. During boot or heading stage.
   b. In fall.

4. What is the difference in amine and ester forms of 2,4-D?

   a. Amine form 2,4-D plus ammonia. Most common form used, not so potent and may injure wheat less. Soluble in water, low volatility (evaporation), minimum drift problem (wind carries it.)

b. Ester form 2,4-D plus alcohol. Costs the most. More potent, more effective. Insoluble in water so need agitation to make an emulsion, or use kerosene or light oil for carrier. Danger from drift and volatility.

5. Which form of 2,4-D would you use if you were spraying a field of wheat alongside your neighbor's alfalfa?

a. Use amine form.
(1) Less drift and volatility.

6. Which form of 2,4-D would you use if you were spraying a semi-resistant weed such as curly dock, ironweed, or Canada thistle.

a. Use ester form.
(1) More potent.

7. Some weeds respond to 2,4-D treatment whereas others don't. What are some weeds easily killed by 2,4-D?

a. Easily killed
(1) Tall morningglory
(2) Venice mallow
(3) Velvetleaf
(4) Yellow rocket
(5) Giant ragweed
(6) Buckhorn
(7) Wild mustard
(8) Common ragweed
(9) Common lambquarters
(10) Ivyleaf morningglory
(11) Pepperweed
(12) Cocklebur
(13) Redroot pigweed

b. Less susceptible
(1) Jimson weed
(2) Annual smartweeds
(3) Pasture thistle
(4) Meadow salsify
(5) Spanishneedles
(6) Chicory
(7) Wild carrot
(8) Mayweed
(9) Field bindweed

8. The weeds listed as easily killed can be killed by ¼ lb. of ester or ½ lb. of amine.

9. The less susceptible weeds require from ½ to 1 lb. of 2,4-D to control them.

10. On some woods you should save your money by not trying to control them with 2,4-D. Can you name some?

    a. Semi-resistant--may require 5 applications to control.
        (1) Western ironwood
        (2) Curly dock
        (3) Canada thistle
        (4) Field horsetail
        (5) Oxeye daisy
        (6) Blue vervain
        (7) Wild onion
        (8) Perennial sowthistle
        (9) Wild parsnip
    b. Resistant--2,4-D does not affect these.
        (1) Common milkweed
        (2) Leafy spurge
        (3) Swamp smartweed
        (4) Western whorled milkweed
        (5) Western yarrow
        (6) Johnsongrass
        (7) Bullnettle
        (8) Wild barley
        (9) Groundcherry

11. Is there a chemical that can be used to control any of those weeds?

    a. MCPA will kill some weeds that are resistant to 2,4-D without injuring the crop.
    b. MCPA should not be used unless recommended.

12. In the "Kansas Noxious Weed Law," page 11 tells how 2,4-D may be used with cropping practices to control field bindweed. Let's go over those methods now.

SUMMARY

Practices we should adopt:
1. Use 2,4-D correctly to control weeds in wheat.
2. Keep list of weeds that 2,4-D will control and the ones it won't control as a handy reference.
3. Try some MCPA on a weed that is resistant to 2,4-D, if recommended.

Chemical Weed Control in Sorghum and Corn

ENTERPRISE: Weed Control

REFERENCES:
1. Weed Control by Crafts and Robbins
2. Bulletin 467, "Chemical Weed Control in Crops"
3. "How to Grow Corn without Weeds or Grasses"
4. "Here are the answers to eight questions about weed control in corn with Atrazine"
5. "Weed Control in Sorghum with Atrazine herbicide"
6. "Atrazine Herbicide"
7. Film "A Way with Weeds"
8. Weed control notes

PROBLEM: What chemicals are recommended to control weeds in sorghum and corn?

OBJECTIVE: To become more familiar with chemicals used to control weeds in sorghum and corn, so I can control weeds in these crops.

MOTIVATION: For controlling weeds in corn and sorghum, Triazine compounds seem to work best. How many of you have used atrazine or simazine to control weeds in your corn? I have a film to show, "A Way with Weeds". It is a Geigy Chemical Company film describing the use of atrazine and simazine for weed control in corn. As you watch the film, questions may arise. Save them for discussion of the film.

SHOW FILM: "A Way with Weeds".

DISCUSSION QUESTIONS

1. Is atrazine one of the best pre-emergence chemicals available for weed control in corn? Why?

   a. Does job of controlling broadleaf and grassy weeds all season long better than any other pre-emergent for weed control in corn.
   b. It doesn't affect corn. May even use 4-5 times recommended dosage and it doesn't hurt corn.

2. Hand out "Chemical Weed Control in Crops".

3. Turn to the page in "Chemical Weed Control in Crops" which gives recommended rates for atrazine. What are they?

   a. 2-3 pounds per acre for pre-emergents.

4. What is CDAA plus TCBC used mainly for and at what rates?

   a. For grass-type weeds in corn and not broadleaf weeds.
   b. 4-6 pounds per acre.

5. What are some limitations in using 2,4-D to control weeds in corn?

   a. Provides control for only 3-4 weeks.
   b. If used as pre-emergent on sandy soils, 2,4-D may leach down and kill corn.
   c. If used as post-emergent, it will not control grassy weeds.

6. What is recommended as a pre-emergent for controlling weeds in sorghum? What rates?

   a. propazine
      (1) 2 lbs. per acre will control broadleaf and grassy weeds.

7. What is recommended for post-emergent weed control in sorghum?

   a. 2,4-D ester
      (1) One-fourth to one-third lb. when sorghum plants are 4-12 inches tall.
   b. 2,4-D amine
      (1) One-third to one-half lb. when sorghum is 4-12 inches tall.
   c. atrazine
      (1) 2-3 pounds per acre after sorghum emerges, but before the grassy woods reach a height of one inch.

8. Hand out "How to Grow Corn without Woods or Grasses" by Geigy Chemical Company.

9. At the back are listed the weeds which Geigy Chemical Company considers to be the 16 major weed pests in corn. Let's discuss these and see how many we are troubled by in corn.

10. Pass out three more pieces of literature on atrazine. Go through the questions and have discussion on the one entitled "Here are the answers to eight questions about weed control in corn with atrazine".

SUMMARY

Practices we should adopt:
1. Use atrazine as a pre-emergent for complete weed control in corn.
2. Use propazine as a pre-emergent for complete weed control in grain sorghum.

Chemical Weed Control in Legumes (Alfalfa and Soybeans)

ENTERPRISE: Weed Control

REFERENCES:
1. Wood Control by Crafts and Robbins
2. Bulletin 467, "Chemical Weed Control in Crops"
3. "Kill Weeds with Vernam"
4. Film "Winning the Weed Battle"
5. Weed control notes

PROBLEM: What chemicals are recommended to control weeds in soybeans and alfalfa?

OBJECTIVE: To become more familiar with chemicals used to control weeds in soybeans and alfalfa.

MOTIVATION: Hand out "Chemical Weed Control in Crops". Is atrazine recommended as a pre-emergent in controlling weeds in soybeans?

DISCUSSION QUESTIONS

1. What is recommended for pre-emergent weed control in soybeans? What rates?
   a. amiben
      (1) Rate of 3-4 pounds per acre.
   b. DCPA
      (1) Rate of 10½ pounds per acre.
2. What types of weeds will amiben control?
   a. Both grass and broadleaf weeds.
3. What types of weeds will CDAA control?
   a. Only grassy weeds.
4. Are trifluralin and vernolate recommended for soybeans?
   a. Yes, if incorporated.
5. Hand out "Kill Weeds with Vernam".

6. Is vernolato recommended in "Chemical Weed Control in Crops"?

   a. Yes, it needs to be incorporated into the soil immediately.

7. In the lesson on weed chemicals, we discussed the group of chemicals called pre-plant chemicals. Does anyone recall the chemical that we said would control weeds in a new stand of alfalfa?

   a. EPTC or Eptam
      (1) Only chemical that can be safely used with alfalfa.

8. Since the method of using pre-plant chemicals is new to some of us, as well as a herbicide that will control weeds in alfalfa, I will show a film, "Winning the Weed Battle", by Stauffer Chemicals. This film gives the latest information about the newest kind of herbicides.

9. Show film, "Winning the Weed Battle".

10. Discuss film. What was one important practice to follow when using pre-plant herbicides?

    a. Spread them evenly and mix in the soil evenly.

SUMMARY

Practices we should adopt:
1. Use amiben for pre-emergent weed control in soybeans.
2. Use trifluralin or vernolate as a soil incorporated herbicide for weed control in soybeans.

Field Chemical Applicators and Sprayer Adjustments

ENTERPRISE: Weed Control

REFERENCES:
1. "How to determine rate of application of field sprays"
2. "Equipping and Calibrating Sprayers"
3. "Guide for Adjusting Field Sprays"
4. "Field Chemical Applicators"
5. "Atrazine Herbicides"
6. "Chemical Weed Control in Field Crops--1968"

PROBLEM: How can I know if my sprayer will put on the right amount of chemical?

OBJECTIVE: To learn how to adjust my sprayer so I can apply the recommended rates of chemicals.

MOTIVATION: How many of you have a sprayer? If we are going to get good results from applying chemicals, we must have our sprayer calibrated correctly.

DISCUSSION QUESTIONS

1. What is calibration?

   a. Calibration simply means that the amount of a chemical mixture (solution or granular) applied to a given area (usually an acre) is determined under specified conditions.
   b. Calibration is affected basically by two factors.
      (1) Tractor speed (4 to 5 miles per hour).
      (2) Properly functioning equipment.

2. What importance does calibration have?

   a. Providing uniform herbicide coverage will give more effective weed control.
   b. Providing correct amount of chemical so crop is not injured and weeds are not left unharmed.

3. What are the calibration procedures?

   a. Check equipment to determine if it is functioning properly.
      (1) Check hoses and fittings for leaks.
      (2) Check pumps for proper output and pressure (usually 25-35 lb.)
      (3) Check tank for foreign materials and leaks.
      (4) Check nozzles for uniformity of discharge rate and spray pattern. Nozzles may be clogged or of the wrong type. Replace worn or damaged nozzles before calibrating.
   b. Fill the spray tank to a known level with clean water (a measuring stick may be useful to mark water level).
   c. Adjust tractor speed to that used to spray in the field, usually 4 to 5 MPH.
   d. Drive exactly 1/8 mile (40 rods or 660 feet) with sprayer operating.
   e. Carefully measure the amount of water needed to refill the spray tank.
   f. Calculate the amount of water used per acre.

4. How can the amount of water used per acre be calculated?

   a. For Broadcast Applications, determine gallons per acre by the following formula:

$$\frac{\text{Number of gallons of water used} \times 66}{\text{Boom width in feet}} = \text{gallons per acre}$$

   Example:

   If the boom width is 20 feet and it took 3.0 gallons of water to travel 1/8 mile, then multiply 3.0 by 66 and divide by 20. The answer, 9.9, is gallons of water per acre.

$$\frac{3.0 \times 66}{20} = \frac{198}{20} = 9.9 \text{ gallons per acre}$$

   b. For Band Applications, use the following formula:

$$\frac{\text{Number of gallons of water used} \times 66}{\text{Band width in ft.} \times \text{number of bands}} = \text{gallons per acre}$$

   Example:

   If 3 bands 2 feet wide each are applied and 1.5 gallons of water are used to spray 1/8 mile, then

multiply 1.5 by 66 and divide by 2 x 3. The 16.5 answer again is gallons of water per acre.

$$\frac{1.5 \times 66}{2 \times 3} = \frac{99}{6} = 16.5 \text{ gallons per acre}$$

5. How can the amount of commercial product needed be calculated?

   a. To determine the amount of commercial product needed of a dry formulation, divide the amount of active ingredient needed by per cent active ingredient on the product label. For a liquid formulation divide the amount of active ingredient needed by pounds per gallon given on the product label.

      Examples:

      Dry formulation: You need 16 pounds of active ingredient. You have an 80% active ingredient wettable powder.

      $\frac{16}{.80} = 20$ pounds of commercial product needed.

      Liquid formulation: You need 15 pounds of active ingredient. You have a liquid product containing 3 pounds of active ingredient per gallon.

      $\frac{15}{3} = 5$ gallons of commercial product needed.

      $$\frac{\text{Number of gallons of spray material to be prepared}}{\text{Number of gallons the sprayer applies per acre}} \times \text{Amount of product needed per acre} = \text{Amount of herbicide product to be added to the spray tank}$$

6. Are the same nozzle tips used for broadcast and band treatments?

   a. When making a band treatment, as is common with preemergent application to row crops, be sure to use tips specifically recommended for band application. They are usually called "even spray" nozzle tips. Standard flat spray nozzle tips should not be used as they give a feathered pattern at the edges and uneven application across the band.

7. What type of nozzle tip should be used when spraying wettable powders?

   a. Stainless steel tips are preferred since other types wear rapidly. Dealers can order such tips if they do not have them in stock.

Introduction to Herbicide Combinations

ENTERPRISE: Weed Control

REFERENCES:
1. Soils and Crops 11th Edition, pp. 57-58
2. Weeds-Vol. 15, No. 1, Jan. 1967. pp. 20-22

PROBLEM: Why should we use herbicide combinations on our crops?

OBJECTIVE: To see, if by using an herbicide combination, I might save money and control more weeds at the same time.

MOTIVATION: If Bill was to use an herbicide combination this year on his corn, what advantages over single herbicides might he gain? What problems might Bill have by using herbicide combinations?

DISCUSSION QUESTIONS

1. What are herbicide combinations?

    a. They are chemical mixtures made up of two or more herbicides.

2. What are the advantages of using herbicide mixtures?

    a. More kinds of weeds can be controlled.
        (1) By combining a grass killer with a broad-leafed weed killer, both types are controlled.
        (2) By combining two herbicides, the mixture may control a weed that would be resistant to either when used alone.
    b. More consistent performance.
        (1) Presently used single herbicides give good weed control about ½ to 3/4 of the time. This performance has varied, especially with rainfall and soils.
        (2) By combining herbicides with contrasting features, it may be possible to get more consistent performance on different soils and a variety of weather conditions than from a single herbicide.
    c. More or less soil residues, depending on mixture.
        (1) May combine two herbicides to give full season weed control instead of only part of the season.

(2) By reducing the amount of each herbicide in a combination, it lessens the amount of residue carried over into the following crop season.

d. Improved crop tolerance.
   (1) Injury to crops may result from some herbicides.
   (2) By combining herbicides, it may be possible to reduce the rates of each to get good weed control and less crop injury.

e. Lower costs
   (1) May reduce rates enough to lower costs per acre and still get as good or better results than from a single herbicide.
   (2) Combining a relatively low cost herbicide with a more expensive herbicide may, because of reduced rates of the costly material, lower the cost.

3. What are the disadvantages of herbicide mixtures?

a. Mixing problems.
   (1) If not already mixed, they have to be mixed.
   (2) Each chemical must also be in a formulation that permits physical mixing in the sprayer tank.

b. Reduced crop tolerance.
   (1) Crop may have a lower tolerance to the herbicides in a mixture than when the specific chemical is used alone.

c. Legal aspects.
   (1) Each herbicide in a combination should be registered with the USDA before it is used on crops.
   (2) Chemical residues could accumulate in plants when in combination even though they don't when used separately.

4. Do scientists have any way to know how herbicides may react in a combination?

a. Yes, by calculating the "expected response".

b. The "expected response" for a combination is obtained by taking the product of the percent-of-control values for herbicides applied alone and dividing by $(100)^{n-1}$ where n is the number of herbicides in the combinations.

c. When the observed response is greater than expected, the combination is synergistic; when less than expected, it is antagonistic. If the observed and expected responses are equal, the combination is additive.

Herbicide Combinations for Crops

ENTERPRISE: Weed Control

REFERENCES:

1. Successful Farming, March, 1967, p. 96
2. Down to Earth, 1966, Vol. 22, pp. 13-15, 20-21.
3. Weeds, Vol. 12, April, 1964.
4. Proceedings-North Central Weed Control Conference, Dec., 1966, pp. 12, 23-24, 47.
5. Down to Earth, 1966, Vol. 21, pp. 24-26, 22-23.

PROBLEM: What herbicide combinations might Tom and Bill choose to control velvetleaf and other weeds in their corn and soybeans?

OBJECTIVE: To compare herbicide combinations that are recommended so I can choose the best herbicide combination for my crop that will control both grassy and broadleaf weeds.

MOTIVATION: Have any of you used an herbicide combination? What were some of the advantages to using herbicide combinations? Not all herbicides can be mixed--some would be like trying to mix water with gas and then getting results from your car.

DISCUSSION QUESTIONS

1. What herbicide combinations are registered and recommended for use in 1968?

CROP	HERBICIDE COMBINATION	BRAND NAME	ADVANTAGES	DISADVANTAGES
Corn	CDAA plus TCBC	Randox-T	CDAA controls grasses; TCBC controls broadleaves	Don't use on sandy soils

Corn	atrazino plus linuron	----	Carryovor of atrazine is less; linuron will control giant foxtail and velvet-leaf	Have to mix yourself
Corn	EPTC plus 2,4-D	Knoxweed	EPTC controls grasses; 2,4-D controls broadleaves; economical	Have to adjust sprayer to keep 2,4-D off corn
Corn	dalapon plus 2,4-D	Dowpon	dalapon controls hard to kill grassy weeds, such as foxtail, Johnsongrass, & shattercane. 2,4-D controls broadleaves.	dalapon could injure corn if sprayed directly on it
Corn	atrazino plus propachlor	----	propachlor will control grasses better than atrazine alone	Have to mix it yourself
Corn	dicamba plus 2,4-D	Banvel-K	Controls 2,4-D tolerant smartweed, wild buckwheat and suppresses Canada thistle. Safer for corn than 2,4-D alone.	Does not control grasses
Soybeans	NPA plus CIPC	Alanap-plus	Controls grasses and broadleaves. Excellent for smartweed control.	Don't use on sandy soils. Possible injury if not careful with rate

2. What herbicide combinations are being tested now which might be recommended in the near future?

CROP	HERBICIDE COMBINATION	ADVANTAGES	DISADVANTAGES
Grain Sorghum	CDAA plus atrazine	Better weed control than either chemical alone, less soil residue	----
Grain Sorghum	CDAA plus propazine	Better grassy weed control than either chemical alone	Poorer non-grass control than propazine alone
Winter Wheat	dicamba plus 2,4-D	100% control of wild garlic with no injury to wheat	----
Winter Wheat	picloram plus MCPA	Excellent for wild buckwheat and other broadleaf weed control	----
Field Beans	trifluralin plus EPTC trifluralin plus CIPC	----	trifluralin was just as effective alone as it was in combination
Sugar Beets	dalapon plus pyazon	Broader weed control with no injury to crop	----
Soybeans	amiben plus NPA	Will control cocklebur and jimsonweed	----
Soybeans	amiben plus trifluralin	Will control ivyleaf, morningglory, velvetleaf, shattercane, and Pennsylvania smartweed	----
Soybeans	amiben plus 2,4-D wax bar	Will control common sunflower	----

Recognizing Herbicide Injury

ENTERPRISE: Weed Control

REFERENCES: 1. Proceedings-North Central Weed Control Conference, p. 28, 1966

PROBLEM: How can I tell if an herbicide has injured my crop?

OBJECTIVE: To determine whether my corn or soybean crop has some herbicide injuries and what factors to correct for future plantings.

MOTIVATION: What causes herbicide injury?
(a) misapplication, (b) carelessness, (c) insufficient crop tolerance, (d) soil and climatic factors beyond human control.
How many of you have seen damage done to corn by herbicides?
What did the corn look like?

PREEMERGENCE APPLICATIONS

CROP	HERBICIDE	INJURY SYMPTOMS
Corn	CDAA-TCBC	Plant will lean and leaves will roll up
Corn	2,4-D	Plant will be twisted and curled and leaves will roll up
Corn	EPTC	Plant will be stunted and malformed; large nodes
Corn	linuron	General stunting and brown leaf tips
Corn	amiben	Stunted with abnormal roots and leaves branching
Soybeans	amiben	Malformed roots and stunted tops
Soybeans	NPA	Roots tend to grow upward
Soybeans	Sodium pentachlorophenate	Brown sections of leaf tissue
Soybeans	linuron	Tops of plants will turn brown

Soybeans	trifluralin	Enlarged crowns and secondary roots above ground level
Soybeans	vernolate	Causes stunting, crinkled leaves, and enlarged crowns

POSTEMERGENCE APPLICATIONS

CROP	HERBICIDE	INJURY SYMPTOMS
Corn	2,4-D	Curled leaves, elbowing of the stalk, and brace roots may be enlarged
Corn	linuron	Burns corn leaves that it contacts
Corn	dalapon	Abnormal ears (such as long or short), curled leaves, and stunting of the plants
Soybeans	4-(2,4-DB)	Wilting of plants and curved stems which will show cracking at the base
Soybeans	2,4-D	Parallel brown lines in leaves
Soybeans	dicamba	Leaves at top of plant will be cupped and crinkled and then die completely

RESIDUES FROM PREVIOUS YEAR

CROP	HERBICIDE	INJURY SYMPTOMS
Oats	atrazine	Grow three or four inches and then all die within a week
Soybeans	atrazine	Purple or brown mottling of leaves to dead plants
Soybeans	TCBC	Cupping and crinkling of soybean leaves

Herbicide Toxicity

ENTERPRISE: Wood Control

REFERENCE: 1. Proceedings-North Central Weed Control Conference, p. 28, 1966

PROBLEM: How dangerous are the herbicides that I plan to use on my soybean and corn crops?

OBJECTIVE: To find out how dangerous the herbicides are which I plan to use this summer on my soybeans and corn.

MOTIVATION: How safe is calcium arsenate which Bill used last week on some bindweed? Where would you look to see how safe calcium arsenate or atrazine are? To determine how safe an herbicide is, scientists determine how many parts per million of that chemical would represent a lethal dose. Some examples of parts per million are: one ounce of sand in 31¼ tons of sand, one inch of 16 miles, a one gram needle in a one ton haystack, or a penny of $10,000.00.

DISCUSSION QUESTIONS

1. What information must be on a posticide label?

   a. Name, brand, or trademark of the product
   b. Name, address of the manufacturer
   c. Net contents
   d. USDA registration number
   e. An ingredient statement
      (1) Common name
      (2) Chemical name
   f. Directions for use
   g. Warning and caution statements

2. What are the classes of pesticides?

   a. Class I (highly toxic)
   b. Class II
   c. Class III
   d. Class IV

3. How are the classes determined?

   a. By the LD50

(1) LD50 is the amount in parts per million which will cause death within 14 days to 50 percent of the test animals so treated.

4. How do we know which class an herbicide comes under?

a. Check labels
(1) Class I (highly toxic) labels must contain:
(a) Skull and crossbone symbol
(b) Word "Poison"
(c) Antidote statement and the sentence "Call a physician immediately".
(d) A word such as "Warning" or "Danger"
(2) Class II labels must contain:
(a) A word such as "Warning" or "Danger"
(b) Need not have skull and crossbones, "Poison", or an antidote statement
(3) Class III labels must contain:
(a) The word "Caution"
(4) Class IV labels need not carry any warning

5. How do I know how much is a lethal dose?

PESTICIDE CLASS	LD50 IN PPM	LETHAL DOSE FOR A 150 LB. MAN
Class I (highly toxic)	Less than 5 to 50	A few drops to 1 teaspoonful
Class II	50 to 500	1 teaspoonful to 2 tablespoonfuls
Class III	500 to 5000	1 pint to 1 pound
Class IV	5000 to 15000	1 pint or 1 pound to 1 quart (2 lbs.)

6. What herbicides are dangerous and which ones are relatively safe?

a. Herbicide classification according to toxicity
(1) Class I (highly toxic)
(a) calcium arsenate
(b) DNBP plus 10%
(c) endothal
(d) sodium arsenite
(2) Class II
(a) diallate
(b) diquat
(c) paraquat
(d) pentachlorophenol
(3) Class III
(a) amiben
(b) arsonates

(c) aspirin
(d) atrazine
(e) CDAA
(f) chlorates
(g) CIPC
(h) dalapon
(i) dicamba
(j) diuron
(k) noroa
(l) picloram
(m) propachlor
(n) salt
(o) TCA
(p) trifluralin
(q) zytron
(r) 2,4-D
(s) 2,4,5-T

(4) Class IV
(a) amitrole
(b) ammonium sulfomato
(c) maleic hydrazide
(d) simazine

7. What is the most important thing to do when we are ready to use an herbicide?

a. Read and follow directions.

Biological Weed Control

ENTERPRISE: Weed Control

REFERENCES:
1. Weed Control by Crafts and Robbins
2. Biological Control of Insect Pests and Weeds, edited by Paul DeBach

PROBLEM: What must I know about biological weed control to use it successfully in my farming program?

OBJECTIVE: To find out how safe, economical, and successful biological weed control would be for me when I have a chance to use it.

MOTIVATION: If you had 160 acres of bindweed to control and Benzabor cost you $40.00 per acre for control, what would be your total cost of bindweed control? $6,400.00. Since Benzabor would sterile your soil for two years, you might lose two crops or about $10,000.00. But, if scientists were to bring in insects that ate the bindweed and destroyed it the first year and did not damage your crops, which method would you rather use to control your bindweed? Incidentally, the insects might be free.

DISCUSSION QUESTIONS

1. What is biological weed control?

   a. It is control of specific weeds by insects or fungus organisms.

2. What are the advantages of biological weed control?

   a. No chemical residue is left on plants or in the soil.
   b. It has been economically cheaper than chemical control.
   c. It is a success once the right insect is found.

3. What factors are necessary for biological control of weeds to work?

   a. The weed must have been introduced to a new area where it was freed of its natural predators.

b. Natural predators must be brought in to control the weeds, but they must be free of their own predators first.

4. Why hasn't more biological weed control been employed?

a. Risk of insect or organism attacking other plants in the vicinity.
b. Risk of insect or organism moving to another vicinity where the plant may be valuable and not considered a weed.
c. There is not always an insect or organism that successfully controls the weed.

5. When was biological weed control first attempted?

a. In 1902, a scientist sent twenty-three species of insects from Mexico, found on the shrub Lantana, to Hawaii to control the shrub there. Lantana had been taken to Hawaii in 1860 and had spread over thousands of acres. Eight species of these insects controlled it.

6. What has been the most successful biological control used?

a. Control of prickly pear cactus in Australia.
(1) The cactus had spread from one plant in 1839 to occupy 60 million acres by 1925.
(2) Mechanical methods of control did not work because it was in pastures with trees.
(3) Chemical control cost about 10 shillings per acre and the land was only worth 5 to 30 shillings.
(4) From 1920 to 1927, scientists hunted for its natural enemy where the cactus was native.
(5) By 1927, three insects--coreid bug, cochineal, and the red spider--were controlling it.
(6) In 1923, the cactoblastic cactorum insect was shipped from Argentina to aid in control. It was this insect who succeeded in more nearly eradicating prickly pear by 1928.
(7) The land now has been returned to useful agriculture.

7. Has any biological weed control been successful in the United States?

a. St. Johnswort is being controlled in the western states, especially California, by three beetles shipped in 1944 and a root borer shipped in 1950.
b. By 1930, St. Johnswort covered 70,000 acres in California.

c. St. Johnswort is poisonous to sheep and had been brought in by sheep from Europe.

8. What other weeds are being controlled biologically?

a. Piripiri in New Zealand and Australia.
b. Clidemia Hirta in the West Indies.
c. Common nutsedge in Hawaii.
d. Common gorse in Europe.
e. Black sage in Mauritius.
f. Manuka in New Zealand.

9. What weeds are scientists working to control biologically now?

a. Tansy ragwort in California.
b. Halogeton glomeratus in western United States.
c. Scotch broom in California.
d. Puncturevine in the United States.
e. Field bindweed in the United States.
f. Hoary cress in the United States.
g. Leafy spurge in the United States.
h. Russian knapweed in the United States.
i. 110 species of weeds are being controlled today in 60 countries with insects.

10. What is the future of biological weed control?

a. It has an unlimited future as long as there are weeds.
b. Many young men are needed in this field with a great future.

Computerized Wood Control for Corn and Soybeans

ENTERPRISE: Wood Control

REFERENCES:
1. IMC Computerized Weed Control Program for Corn and Soybeans 1968 Planting Season
2. Interview with Dr. Sam Unger, Agri-Research

PROBLEM: What is the newest idea in weed control that I might be able to use in helping control weeds in my farming program?

OBJECTIVE: To find out how I could use computerized wood control in my farming program.

MOTIVATION: How would you like to read some information over the telephone to a computer and find what would be the best herbicide to use in your corn? Would you get a different answer if you were wanting to control Johnsongrass rather than velvetleaf?

DISCUSSION QUESTIONS

1. What is computerized weed control?

   a. It is the using of a computer to help select the herbicide for a crop that will do the best job.
   b. It was started by International Minerals and Chemical Corporation of Skokie, Illinois.

2. Could this computerized weed control be used now?

   a. Yes, if a fertilizer dealer of International Minerals and Chemical Corporation is close enough to be talked to.
   b. One must go through a dealer at present.

3. Is this service free?

   a. No, but it might save one more money on a herbicide by deciding on the correct one.

4. What information must be filled out so it can be fed into the computer?

a. There are eight questions pertaining to cropping plans and field conditions.
b. There are three questions pertaining to the severity of three perennial grasses.
c. There are three questions pertaining to the severity of three annual grasses.
d. There are four questions pertaining to the severity of four perennial broadleaf weeds.
e. There are thirteen questions pertaining to the severity of thirteen annual broadleaf weeds.
f. There are a total of thirty-one questions to be checked on the form.

5. How successful has this idea been utilized?

a. About 250 farmers in the corn belt used it in 1967.
b. These farmers were very satisfied with their results.

6. Does this company make money on their idea?

a. No
   (1) The company doesn't charge the farmer enough to cover the cost.
   (2) The company has the computer programmed with every recommended herbicide for corn and soybeans.

7. Does computerized weed control have a future?

a. Yes, as long as there are weeds.
b. It needs to be expanded so it is available to all farmers and for all crops.
c. The service should always be provided by a company that does not handle only certain brands of herbicides.

Field Trip to Weed Supervisor's Office
and an Experiment Station

ENTERPRISE: Weed Control

PROBLEM: How can the weed supervisor be of help to me? What weed control experiments are being carried on at an Experiment Station?

OBJECTIVE: To gain an understanding of the weed supervisor's job so I may be more capable of utilizing his help in controlling my weeds. To gain a better understanding of weed control research.

THIS WILL BE AN ALL-AFTERNOON FIELD TRIP TO THE WEED SUPERVISOR'S OFFICE AND THEN TO AN EXPERIMENT STATION.

FINDINGS

FINDINGS

The findings of the study were taken from the comparison of the pre-test scores and post-test scores earned by high school students before and after the source unit on weed control was taught to them. The test scores were recorded from a weed control test designed to measure knowledge in this area.

The vocational agriculture classes at Jewell High School were used in this study to test the value of the source material. Twenty-nine students were divided into two groups. Five seniors and eleven freshmen, totaling sixteen students, made up the control group. (Table I) Eight juniors and five sophomores, totaling thirteen students, made up the experimental group. (Table II)

In regard to variables, the intelligent quotient (IQ) scores from the California Mental Maturity Test were obtained on the sophomores, juniors, and seniors. The intelligent quotient scores were not available for the freshmen.

The mean score of the intelligent quotient scores of the five seniors in the control group was 105 and the median score was 108. The range was from 83 to 119.

The mean score of the intelligent quotient scores of the five sophomores in the experimental group was 105 and the median score was 106. The range was from 92 to 112.

The mean score of the intelligent quotient scores of the eight juniors in the experimental group was 104 and the median score was 106. The range was from 86 to 119.

Other variables not measured in the control group and experimental group were assumed to be the same.

The test used for obtaining the pre-test and post-test scores was developed by selecting multiple choice questions from the source unit. This made a test of 100 possible points for each student. Each question contained four choices of words or statements. The students were asked to select one of the four answers that did the best job of completing the statement and to put the letter of that answer in the blank at the left of the question. (See Appendix A)

The test was duplicated so each student had a copy. It was administered during one fifty-five minute regular class period. The pre-tests were collected and filed. The pre-tests were not scored or examined by anyone until after the post-test was given.

The results of the study were placed in table and graph form and are shown on the following pages of this report.

The data with regard to individual student scores in the control group on the pre-test and post-test were presented in Table I. This group of sixteen students made up the control group. They did not, at any time, receive any instruction from the source unit.

The five seniors had a total pre-test score of 259 and a post-test score of 273 out of 500 possible points. The highest and lowest score on the pre-test was 62 and 36 respectively and the post-test range was 45 to 62. The eleven

freshmen scored 410 on their pre-test and 410 on their post-test out of 1,100 possible points. Their highest and lowest score on the pre-test was 47 and 20 respectively and the post-test range was 26 to 51.

The control group had a score of 669 on the pre-test and 683 on the post-test. They increased their total score by 14 points.

TABLE I

SUMMARY OF TEST RESULTS BY INDIVIDUAL STUDENTS IN THE CONTROL GROUP

Seniors	Pre-test Score	Post-test Score	Freshmen	Pre-test Score	Post-test Score
Jim	62	58	Charles	34	31
Calvin	55	58	Greg B.	20	34
Max	44	50	A. J.	45	34
Roy	36	45	Dirk	42	49
John	62	62	Jim	27	33
			Wayne	28	26
			Rex	47	40
			Tim	45	51
			Rodney	45	37
			James	43	39
			Greg M.	34	36
Total	259	273	Total	410	410
Average	51.8	54.6	Average	37.3	37.3

The data with regard to individual student scores in the experimental group on the pre-test and post-test were presented in Table II. This group of thirteen students made up the experimental group. They received instruction based on the source unit between the pre-test and post-test.

TABLE II

SUMMARY OF TEST RESULTS BY INDIVIDUAL STUDENTS IN THE EXPERIMENTAL GROUP

Juniors	Pre-test Score	Post-test Score	Sophomores	Pre-test Score	Post-test Score
Don	44	76	Edwin	46	95
Lon	26	73	Dan	46	93
Mark C.	48	83	Curt	37	90
Roger	49	86	Rick H.	40	87
Mark N.	35	66	Rick B.	62	95
Allan	35	74			
Jerry W.	54	85			
Jerry B.	47	83			
Total	338	626		231	460
Average	42.2	78.2		46.2	92.0

There were eight juniors who had a total pre-test score of 338 and a post-test score of 626 out of 800 possible points. The highest and lowest score on the pre-test was 48 and 26 respectively and the post-test range was 66 to 86.

The five sophomores scored 231 on their pre-test and 460 on the post-test out of 500 possible points. Their highest and lowest score on the pre-test was 62 and 37 respectively and the post-test range was 87 to 95.

The experimental group had a score of 569 on the pre-test and 1,086 on the post-test. They increased their total score by 517 points.

The data showing average class and group scores on the pre-test was presented in Table III. The number of students in each class and group, the total points possible, and total

scores for each class and group were shown. These scores were presented and discussed in connection with Tables I and II.

The five seniors had the highest average score on the pre-test with 51.80 points. The five sophomores were next with a score of 46.20, followed by the eight juniors with a score of 42.25. The eleven freshmen had an average score of 37.27 points. This same data presented in percentage form and showing average percent for each class is as follows: seniors, 51.80 percent; sophomores, 46.20 percent; juniors, 42.25 percent; and freshmen, 37.27 percent.

A summary of the scores on the pre-test by groups showed that the control group (seniors and freshmen) had an average score of 41.81 and the experimental group (juniors and sophomores) had an average score of 43.77. This represents a total difference between average group scores of 1.96 on the pre-test.

TABLE III

SUMMARY OF TEST RESULTS ON THE PRE-TEST

Group	No. Boys	Total Score	Class Score	Per Cent of Perfect	Average Score/Boy
Control Group:					
Seniors	5	500	259	51.80	51.80
Freshmen	11	1,100	410	37.27	37.27
Total	16	1,600	669	41.81	41.81
Experimental Group:					
Juniors	8	800	338	42.25	42.25
Sophomores	5	500	231	46.20	46.20
Total	13	1,300	569	43.77	43.77

The data showing average class and group scores on the post-test were presented in Table IV. The number of students in each class and group, the total points possible, and total scores for each class and group were shown. These scores were presented and discussed in connection with Tables I and II.

TABLE IV

SUMMARY OF TEST RESULTS ON THE POST-TEST

Group	No. Boys	Total Score	Class Score	Per Cent of Perfect	Average Score/Boy
Control Group:					
Seniors	5	500	273	54.60	54.60
Freshmen	11	1,100	410	37.27	37.27
Total	16	1,600	683	42.69	42.69
Experimental Group:					
Juniors	8	800	626	78.25	78.25
Sophomores	5	500	460	92.00	92.00
Total	13	1,300	1,086	83.54	83.54

The five sophomores had the highest average score on the post-test with 92.00 points. The eight juniors were next with a score of 78.25, followed by the five seniors with a score of 54.60 and the eleven freshmen with a score of 37.27. This same data presented in percentage form and showing average percent for each class is as follows: sophomores, 92.00 percent; juniors, 78.25 percent; seniors, 54.60 percent; and freshmen, 37.27 percent.

A summary of the scores on the post-test by groups showed that the control group (seniors and freshmen) had an

average score of 42.69 and the experimental group (juniors and sophomores) had an average score of 83.54. This represents a total difference of 40.85 points between average group scores.

The average class scores on the pre-test and the post-test were presented in graph form in Figure 1. A total of 100 points was possible on the test. The seniors, juniors, and sophomores increased their scores on the post-test over the pre-test. The freshmen test scores were the same on the pre-test and post-test. The increases were as follows:

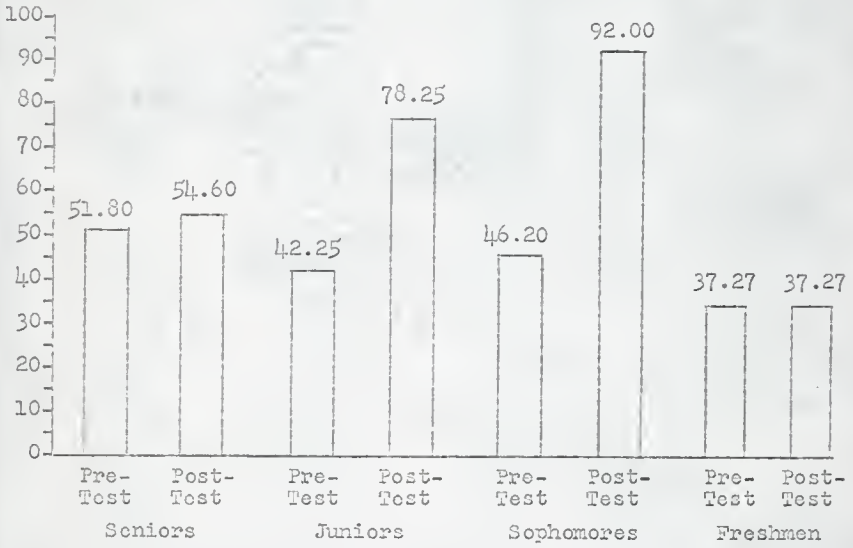

FIGURE 1

AVERAGE CLASS SCORES ON THE PRE-TEST AND POST-TEST

(a) In the control group, the seniors increased their average score 2.80 points while the freshmen average score remained the

same on both the pre-test and the post-test. (b) In the experimental group, the juniors increased their average score 36.00 points and the sophomores increased their average score 45.80 points. The sophomore class had the highest average class score with 92.00 points on their post-test and the freshmen class had the lowest class score with 37.27 points on their pre-test.

The average group scores on the pre-test and the post-test were presented in graph form in Figure 2. The average scores of the students having access to lessons from the source unit (experimental group) were contrasted with the average scores of the students not having access to lessons from the source unit (control group).

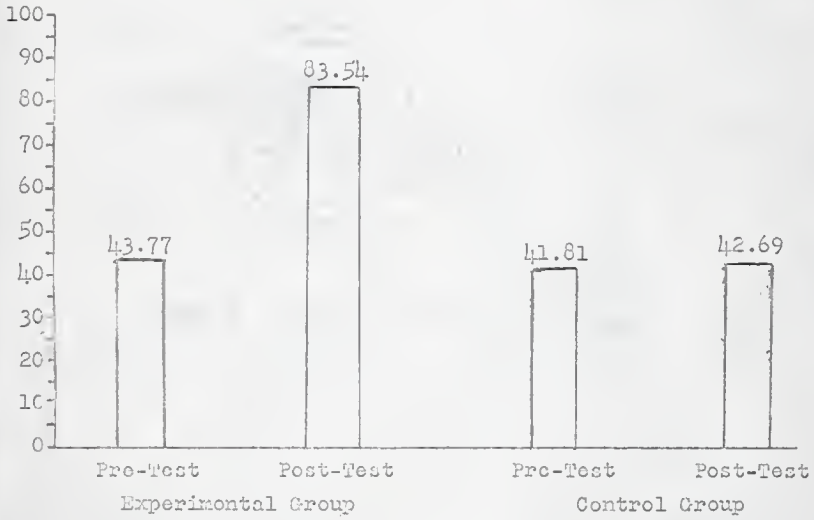

FIGURE 2

AVERAGE GROUP SCORES ON THE PRE-TEST AND POST-TEST

It was found that the students who did not have lessons from the source unit scored an average of 41.81 points on the pre-test and 42.69 points on the post-test out of a possible 100 points. It was also found that the students who had received instruction from the source unit scored an average of 43.77 points on the pre-test and 83.54 points on the post-test out of a possible 100 points.

The results of the comparison showed that the students receiving instruction from the source unit increased their scores by an average of 39.77 points, and that the students who did not receive instruction from the source unit increased their scores by an average of 0.88 points.

This same data presented in percentage form comparing the two groups showed that the experimental group increased their average score by 90.90 percent and the control group increased their average score by 2.10 percent.

The group of students having lessons from the source unit had a total difference of 88.80 percent over the group that did not have any lessons from the weed control source unit.

SUMMARY

SUMMARY

The main purpose of this study was to evaluate source material and develop a weed control source unit for agronomic crops in prepared lessons that might be used by vocational agricultural teachers in preparing and teaching lessons on weed control. Another purpose of this study was to evaluate the effectiveness of the source unit.

A source unit, for the purposes of this study, was interpreted as a collection of subject material pertaining to weed control and presented in lessons that could serve as a short-time teaching plan for Kansas vocational agricultural teachers in teaching vocational agriculture classes and/or adult farmer classes. The source unit was designed to contain more information than most vocational agricultural teachers would want to use in one class. The source unit was also designed to be accumulative in nature, with new materials being added as new ideas and information became available.

In developing this study, the following procedures were used:

1. Names of specific weeds, consisting of the Kansas noxious weeds and others considered very harmful in agronomic crops, were obtained by interviewing Dr. L. E. Anderson, Professor of Agronomy, Kansas State University. These were used as a guideline

to help keep the weed control source unit practical. The names of weeds obtained from interviewing are listed in the appendix.

2. Information for developing this source unit was obtained from technical publications, text books, magazines, and by interviews. Information was found in the Kansas State University Library, in the Agronomy Library in Waters Hall at Kansas State University, and in the personal library of the author of this report. In addition to surveying the above mentioned libraries, interviews were held with various specialists in the state of Kansas to gather background information. The following were interviewed: Dr. L. E. Anderson, Professor of Agronomy, Kansas State University; Dr. Kurt Feltner, Professor of Agronomy, Kansas State University; Mr. Don Modlin, Weed Supervisor, Jewell County, Kansas; and Dr. Sam Unger, Agricultural Economist, Agri-Research, Manhattan, Kansas.
3. The above material and interviews were reviewed. Selections from the material and interviews were made on their potential usefulness in helping Kansas vocational agricultural teachers teach lessons on weed control.
4. A tentative source unit was developed. It contained information in the following areas:

(a) Introduction and Importance of Weed Control

(b) Classification and Identification of Weeds

(c) Review Identification of Weeds and Field Trip

(d) Cultural Weed Control

(e) Laws Pertaining to Weed Control

(f) Introduction to Weed Chemicals

(g) Built-In Protection of Chemicals and Chemical Safety

(h) Chemical Weed Control in Wheat

(i) Chemical Weed Control in Sorghum and Corn

(j) Chemical Weed Control in Legumes (Alfalfa and Soybeans)

(k) Field Chemical Applicators and Sprayer Adjustments

(l) Introduction to Herbicide Combinations

(m) Herbicide Combinations for Agronomic Crops

(n) Recognizing Herbicide Injury

(o) Herbicide Toxicity

(p) Biological Weed Control

(q) Computerized Weed Control for Corn and Soybeans

(r) Field Trip to Weed Supervisor's Office and an Experiment Station

5. The tentative source unit was submitted to an advisory committee of two specialists. One was Dr. R. J. Agan, Professor of Agricultural Education, Kansas

State University, who reviewed the source unit from the standpoint of its organization and its value in meeting the needs of vocational agricultural teachers; the other was Dr. Kurt Feltner, Professor of Agronomy, Kansas State University, who reviewed the source unit from the standpoint of its technical information.

6. The source unit was then revised on the basis of suggestions made by the advisory committee.
7. A multiple choice 100 question test, based on the material in the source unit, was developed. This examination was reviewed by three specialists. One was Dr. R. J. Agan, Professor of Agricultural Education, Kansas State University, who reviewed the examination from the standpoint of its organization; one was Dr. Kurt Feltner, Professor of Agronomy, Kansas State University, who reviewed the examination from the standpoint of its technical information; one was Mr. Don Modlin, Weed Supervisor from Jewell County, Kansas, who reviewed the examination from the standpoint of its practicality in pertaining to weed control. No major revisions were made from the tentative examination.

A purpose of this study was to evaluate the effectiveness of the source unit. The usefulness of the material in the source unit was evaluated by a comparison of pre-test and post-test

scores taken in connection with the teaching of lessons from the unit to Jewell High School vocational agriculture students. These students were divided into two groups. The freshmen and seniors were the control group and the sophomores and juniors were the experimental group.

It was assumed for the purposes of this study that the grouping was equal in that the variables of one group was canceled out by the variables of the other group. The intelligence quotient (IQ) scores were not available for the freshmen. It was found that the average intelligence quotient in the sophomore class was 105. In the junior class, the average intelligence quotient was 104. In the senior class, the average intelligence quotient was 105.

All students were given the pre-examination on April 22, 1968, before any lessons on weed control were taught from the source unit. Their scores on this examination were recorded after the post-test was given.

The lessons in this source unit were taught to the experimental group of vocational agriculture students in Jewell High School from April 23, 1968, to May 14, 1968 for a total of fifteen days.

The same examination on weed control was re-administered to all the vocational agriculture students on May 15, 1968. The results of this examination were recorded.

The comparison of results of the pre-examination and the follow-up examination was analyzed. The students that

received instruction and those that did not receive instruction based on the lessons in the source unit were compared.

The findings showed that the experimental group who received instruction from the source unit increased their scores from the pre-test to the post-test by an average of 39.77 points or by 90.90 percent. The control group who did not receive instruction based on the source unit increased their scores by an average of 0.88 points or by 2.10 percent. There was a total difference of 38.89 points or 88.80 percent between the experimental group and the control group.

Implications

The author of this report felt that the findings were valid in showing the results that could be expected from the weed control source unit. He further felt that this source unit could show excellent reliability if used by other vocational agricultural teachers. The author of this report, because of his interest and enthusiasm for this area of teaching, felt that it might be difficult for other vocational agricultural teachers to obtain results that show as much reliability as was shown in this study.

The experimental group (sophomores and juniors) received the same number of hours from the source unit. The sophomores had a mean score on the post-test of 92.00 while the juniors had a mean score of 78.25. The average intelligent quotient in the sophomore class was 105 and the average intelligent quotient in the junior class was 104.

The difference between the sophomore group and the junior group would have to be explained by some other factor not measured. It was the author's opinion that one or several of the following factors may have affected the findings. The factors were:

1. The sophomore class was taught each lesson after the junior class had been taught.
2. There was one student in the sophomore class who showed much enthusiasm for the lessons.
3. The sophomore class as a whole showed more enthusiasm for vocational agriculture than did the junior class.
4. The sophomore class was taught right after dinner while the junior class was taught before dinner.

The author of this report felt that this study could be updated every three years by someone who could use it as a master's report. If this study was updated in three years, the author of this study felt that the author of the new study might want to improve this study by trying one or more of the following:

1. Alternate the teaching in the classes so one class does not always receive the lessons first.
2. Have at least one other vocational agricultural teacher in another school follow the same procedure in testing and teaching the study.
3. Develop the source unit into a programmed text.

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APPENDIXES

APPENDIX A

WEED CONTROL TEST

Name _____ Class _____

Instructions: Select one of the four answers that does the best job of completing the statement. Put the letter of that answer in the blank at the left of the question.

A 1. The weed loss in the United States has been estimated at (a) 5 billion dollars (b) 20 million dollars (c) 800 million dollars (d) 1 billion dollars a year.

B 2. For every 160 acres of crops harvested in Kansas, weeds cost the farmer about (a) 500 dollars (b) 1,000 dollars (c) 1,500 dollars (d) 2,000 dollars.

D 3. Weeds decrease crop yields by competing with crops for (a) nitrogen, phosphorus, and potash (b) carbon dioxide, nitrogen, and light (c) nutrients, air, and light (d) moisture, nutrients, and light.

C 4. A check of 181 species of weeds showed that they produced an average of (a) 5,000 (b) 17,000 (c) 21,000 (d) 28,000 seeds per plant.

A 5. The two most important principles of weed control are to (a) prevent seed production and spread of weeds by man (b) prevent its spread by roots and prevent its spread by livestock (c) stop it by not planting it and stop it by not selling it (d) prevent it by mowing and prevent it by chemicals.

C 6. Man has introduced about (a) 100 (b) 250 (c) 500 (d) 800 species of weeds into the United States.

A 7. The characteristics which best describe a perennial are that it (a) lives more than two years and produces seeds too (b) lives one season and reproduces by seeds each year (c) lives two seasons and reproduces the second season (d) lives three seasons and reproduces the first season.

B 8. The characteristics which best describe an annual are that it (a) lives more than two years and produces seeds too (b) lives one season and reproduces by seed each year (c) lives two seasons and reproduces the second season (d) lives three seasons and reproduces the first season.

D 9. Annual weeds are hard to control because (a) chemicals are not effective (b) they live several years (c) they are classified as noxious (d) of the number of seeds produced.

C 10. Rhizomatous perennials are hard to control because they (a) produce more seeds than other types of weeds (b) cannot be controlled by chemicals (c) are easily spread by cultivation, reproducing from nodes in the rhizomes (d) are hard to control by biological methods.

A 11. Introduced weeds are sometimes more difficult to control than native weeds because (a) the weeds' natural enemies are not present (b) the climate is better (c) the weeds are usually perennials (d) no one knows how to control them.

A 12. If a weed is a rhizomatous perennial it should be controlled by (a) chemicals (b) mowing (c) cultivation (d) biological means.

C 13. The type of weed which is the easiest to control by cultivation is the (a) creeping perennial (b) rhizomatous perennial (c) annual (d) biennial.

C 14. The most effective way to combat weeds in a crop-weed association is to (a) use chemicals (b) use cultivation in row crops (c) follow a desirable rotation of crops (d) check for weed seeds in a crop before planting it.

B 15. Shallow cultivation is recommended to control (a) biennials (b) annuals (c) perennials (d) the bindweeds.

D 16. Depletion of root carbohydrates through cultural and chemical means is recommended for controlling (a) green foxtail (b) rough pigweed (c) lamb's quarter (d) field bindweed.

A 17. One of the advantages of biological weed control is that (a) there is no chemical residue left (b) it is simple and economical for almost all species (c) it can be used in a small area (d) it is effective for all weeds in a field.

A 18. The main purpose of weed laws is (a) to keep man from spreading weeds (b) to help farmers decide what method of control to use (c) to show what weeds are the worst pests (d) to keep your neighbor from growing weeds.

A 19. A person in Kansas can send into the state seed laboratory to have tested for purity and germination at no cost (a) 2 (b) 4 (c) 5 (d) 10 samples.

B 20. Before a herbicide can be added to the approved chemical list it must be (a) almost as good as any other (b) as good as any other (c) somewhat better than any other (d) definitely better than any other.

D 21. A weed gets added to the noxious weed list by being (a) decided on by Dr. Mader of the Agronomy Dept. at Kansas State University (b) decided on by a committee of weed experts at the state agricultural college (c) voted on by your county governing group (d) voted on by the state legislature.

A 22. An herbicide is a chemical used to control (a) any undesirable plant including trees (b) only specific weeds (c) weeds and insects (d) only insects that are attracted to weeds.

C 23. A weedicide is a chemical used to control (a) the noxious weeds (b) any undesirable plant including trees (c) only specific weeds (d) weeds and insects.

A 24. A desiccant kills a plant (a) on contact (b) by being absorbed through the roots and translocated to the leaves (c) by making the plant grow excessively (d) by stunting the plant so it can't grow.

B 25. A selective herbicide is one that will control (a) any undesirable plant including trees (b) certain plants while it won't harm others (c) weeds that are resistant to 2,4-D (d) the noxious weeds.

A 26. (a) MCPA (b) 2,4,5-T (c) atrazine (d) alanap will control wild mustard in wheat without harming the wheat.

C 27. (a) Alanap (b) propazine (c) atrazine (d) zytron will control most annual weeds in corn without harming the corn.

B 28. Pre-emergents are used mainly in (a) wheat (b) row crops (c) alfalfa (d) barley to control weeds.

B 29. Sodium chlorate is classified as a (a) selective herbicide (b) nonselective herbicide (c) pre-emergent (d) contact herbicide.

D 30. Zytron will control (a) treacle mustard in barley (b) treacle mustard in wheat (c) green foxtail in soybeans (d) crabgrass in Kentucky bluegrass.

A 31. Eptam will control (a) annual weeds in alfalfa (b) broadleaf weeds in wheat (c) broadleaf weeds in row crops (d) perennial weeds in almost all crops.

B 32. The best type of herbicide for controlling a perennial weed is a (a) non-hormone type (b) translocated type (c) pre-emergent type (d) pre-plant type.

B 33. If you have a material that is 90% active and you want to apply 90 lbs. per acre of actual chemical, you would need to apply (a) 90 lbs. (b) 100 lbs. (c) 180 lbs. (d) 900 lbs. of the material.

C 34. (a) The tomato plant (b) field bindweed (c) buffalobur (d) kochia is very resistant to 2,4-D.

C 35. For every one chemical that a company sends to an experiment station, they discard (a) 100 to 200 (b) 500 to 1,000 (c) 1,000 to 3,000 (d) 4,000 to 6,000 others.

A 36. A chemical is tested so much that it takes from (a) 7 to 10 (b) 10 to 12 (c) 12 to 15 (d) 15 to 20 years before it is sold on the market.

B 37. The (a) state legislature (b) Pure Food and Drug Administration (c) Federal Testing Service (d) Federal Health Service establishes residue tolerances for herbicides.

A 38. 2,4-D should be applied to wheat when the wheat is (a) fully tillered to early boot stage (b) in the boot or heading stage (c) ready to be harvested (d) coming up in the fall.

C 39. The amine form of 2,4-D is (a) more expensive (b) more effective (c) more commonly used (d) more apt to drift than the oster form of 2,4-D in controlling weeds in wheat.

D 40. (a) Johnsongrass (b) ground cherry (c) common milkweed (d) field bindweed can be controlled with 2,4-D.

B 41. If you were spraying a field of wheat alongside your neighbor's alfalfa, you would choose (a) ester form of 2,4-D (b) amine form of 2,4-D (c) atrazine (d) amiben.

D 42. If you wanted to control common milkweed in a wheat field, you would choose (a) the ester form of 2,4-D (b) the amine form of 2,4-D (c) propazine (d) MCPA.

B 43. (a) Propazine (b) atrazine (c) the ester form of 2,4-D (d) the amine form of 2,4-D would be the best to control broadleaf and grassy weeds in corn.

A 44. (a) Propazine (b) atrazine (c) the ester form of 2,4-D (d) the amine form of 2,4-D would be the best to control broadleaf and grassy weeds in sorghum.

A 45. (a) Amiben (b) vernam (c) tillam (d) atrazine would be the best herbicide to use when controlling broadleaf and grassy weeds in soybeans.

C 46. (a) Amiben (b) vernam (c) tillam (d) atrazine would be the best herbicide to use as a pre-plant chemical to control broadleaf and grassy weeds in a new stand of alfalfa.

B 47. The advantage of using eptam plus 2,4-D in corn would be that (a) eptam would control broadleaf weeds better than 2,4-D (b) both broadleaf and grassy weeds would be controlled (c) the mixture could be sprayed on top of the corn (d) it could be applied just before the corn was planted.

A 48. More kinds of weeds may be controlled by using (a) herbicide combinations (b) increased dosages of recommended herbicides (c) new herbicides that are not yet recommended (d) antagonistic herbicides with lower costs and with even more consistent performance.

C 49. Wild buckwheat could be controlled in winter wheat by using (a) alanap plus CIPC (b) Banvel-D plus 2,4-D (c) Tordon plus 2,4-D (d) atrazine plus Ramrod, if it had clearance for use on wheat.

D 50. (a) Misapplication (b) insufficient crop tolerance (c) soil and climatic factors beyond human control (d) following directions will usually not result in herbicide injury to a crop.

A 51. 2,4-D injury to corn is usually characterized by (a) twisted stalks with the leaves rolled up (b) malformed roots with stunted tops (c) upward growing roots (d) large nodes.

C 52. If you had an atrazine residue from the previous year and you planted oats, you could expect the oats to

(a) grow naturally (b) grow 5 feet high and then die (c) grow 3 inches high a d then die (d) be delayed for about 3 weeks.

C 53. To determine how safe an herbicide is, scientists determine parts per (a) 100 (b) 1,000 (c) 1,000,000 (d) 1,000,000,000 of that chemical that would represent a lethal dose.

A 54. There are (a) 4 (b) 6 (c) 8 (d) 10 different classes of pesticides.

A 55. Class (a) I (b) II (c) III (d) IV represents the class that is highly toxic.

A 56. In Class I, you find (a) the skull and crossbone symbol (b) the word warning (c) the word danger (d) directions for use.

C 57. Class (a) I (b) II (c) III (d) IV must contain the word caution on its label.

D 58. Class (a) I (b) II (c) III (d) IV need not carry any warning.

A 59. If an herbicide is in class I, the lethal dose for a 150 lb. man would be (a) less than one teaspoon (b) two tablespoons (c) one pound (d) one gallon.

C 60. Aspirin and salt are in the same class as (a) calcium and arsenate (b) simazine (c) dalapon (d) dinitro.

B 61. Biological weed control has been the most successful in controlling (a) tansy ragwort in California (b) prickly pear cactus in Australia (c) Russian knapweed in the United States (d) common nutsedge in Hawaii.

B 62. Biological weed control would be safer than chemical weed control because (a) no weeds could escape (b) no chemical residue is left (c) man would not have to stand the chance of being run over by his machine (d) weeds would be controlled before the weeds controlled the crops.

C 63. One reason that biological weed control has not been too successful is that (a) people do not want insects or diseases helping to fight weeds (b) the weed must first be considered noxious (c) predators must be free of their own predators first (d) weeds will become resistant to the biological method used to control it.

C 64. The best way, disregarding cost, of controlling weeds is (a) cultural (b) chemical (c) biological (d) flooding.

A 65. To be sure of controlling a weed either culturally, chemically, or biologically, one must (a) follow directions (b) use the method twice (c) combine everything and put it on the weed (d) spend too much time to make it worthwhile.

Instructions: Select the answer that best completes the statement as it applies to the weed mount.

D 66. This weed is (a) giant foxtail (b) common sudangrass (c) barnyardgrass (d) Johnsongrass.

C 67. This weed is hard to control because it is (a) an annual (b) a biennial (c) a perennial (d) a semi-prevalent weed.

B 68. This weed matures about the same time as does (a) wheat (b) grain sorghum (c) oats (d) barley.

B 69. This weed is (a) hedge bindweed (b) field bindweed (c) wild buckwheat (d) climbing milkweed.

D 70. This weed is a (a) simple perennial (b) bulbous perennial (c) rhizomatous perennial (d) creeping perennial.

A 71. If you decided to control this weed culturally, you would want to (a) deplete carbohydrates from the roots (b) cultivate often enough to prevent seed production (c) cultivate 1 to 1½ inches deep (d) cultivate every day for 30 days.

D 72. If you decided to control this weed chemically, you would want to use a (a) pre-emergent herbicide (b) contact herbicide (c) post-emergent herbicide (d) soil sterilant herbicide.

C 73. This weed is (a) rough pigweed (b) smooth pigweed (c) kochia (d) lamb's quarters.

C 74. This weed is hard to control because it (a) is a biennial (b) spreads by roots (c) produces many seeds (d) is resistant to many herbicides.

___ 75. If you wanted to control this weed in corn with a pre-emergence herbicide you would use (a) CDAA plus TBC (b) atrazine (c) the ester form of 2,4-D (d) propazine.

C 76. This weed is usually the worst pest in (a) soybeans (b) alfalfa (c) grain sorghum (d) oats.

D 77. This weed is (a) giant ragweed (b) common ragweed (c) smooth pigweed (d) rough pigweed.

A 78. This weed is (a) easily killed by (b) semi-resistant to (c) hard to kill by (d) impossible to kill by 2,4-D.

B 79. The seed of this weed would be easy to take out of the common crops by a fanning mill because of its (a) shape (b) size (c) color (d) hardness.

D 80. (a) Sodium chlorate (b) dinitro (c) dalapon (d) atrazine would be the best herbicide to control this weed in corn.

B 81. This weed is (a) Canada thistle (b) leafy spurge (c) nodding thistle (musk thistle) (d) Russian knapweed.

C 82. This weed is (a) an annual (b) a biennial (c) a perennial (d) a common weed.

A 83. The best type of control would be (a) soil sterilant (b) cultivation (c) mowing (d) biological.

B 84. If controlling this weed with 2,4-D, you would want to (a) use less than recommended (b) use what was recommended (c) use more than recommended (d) mix in gasoline.

C 85. This weed is (a) Canada thistle (b) leafy spurge (c) nodding thistle (musk thistle) (d) Russian knapweed.

D 86. This weed represents (a) no (b) some (c) much (d) the biggest threat to Kansas farmers as far as weeds are concerned.

B 87. This wood can best be controlled by (a) mowing (b) Benzabor (c) cultivation (d) propazine.

B 88. According to (a) Kansas Chemical Spray Law (b) Kansas Noxious Weed Law (c) Kansas Seed Law (d) Pure Food and Wood Department this weed must be controlled on your land.

A 89. The following weed is (a) velvetleaf (b) cocklebur (c) common ragweed (d) rough pigweed.

A 90. This weed is (a) easily killed (b) somewhat hard to kill (c) very hard to kill (d) never killed with 2,4-D.

A 91. This weed is (a) an annual (b) a biennial (c) a perennial (d) a semi-perennial.

B 92. This weed could best be controlled in corn by (a) Dowpon (b) Banvel-D (c) atrazine (d) atrazine plus Ramrod.

C 93. This weed is (a) field bindweed (b) hedge bindweed (c) wild buckwheat (d) annual morningglory.

A 94. The best herbicide to use to control this weed in wheat is (a) dicamba (Banvel D) (b) 2,4-D (c) MCPA (d) Bromoxynil.

D 95. The best herbicide to use to control this weed in corn is (a) Ramrod (b) Dowpon (c) EPTC (d) dicamba.

A 96. The best herbicide to use to control this weed in soybeans is (a) Alanap (b) atrazine (c) simazine (d) propazine.

B 97. This weed is (a) yellow foxtail (b) green foxtail (c) crabgrass (d) barnyard grass.

A 98. This weed could best be controlled in corn with (a) eptam (b) Banvel-D (c) sodium chlorate (d) Benzabor.

B 99. This wood is hard to control because (a) it spreads by roots (b) it produces a large number of seeds (c) it is a perennial (d) it is resistant to most herbicides.

D 100. This wood would be the least problem in (a) corn (b) grain sorghum (c) soybeans (d) wheat.

APPENDIX B

NAMES OF WEEDS HARMFUL IN AGRONOMIC CROPS

Tho following names of weeds consisted of the Kansas noxious weeds and other specific ones that were considered as very harmful in agronomic crops. The names of these weeds were obtained by interviewing Dr. L. E. Anderson, Professor of Agronomy, Kansas State University. These were used as a guideline to help keep the weed control source unit practical.

Kansas Noxious Weeds

field bindweed
hoary cress
Russian knapweed
Johnsongrass
Canada thistle
musk thistle
leafy spurge
Indian rushpea
quackgrass
goatgrass
bur ragweed

Other Weeds Harmful in Agronomic Crops

kochia
redroot pigweed
smooth pigweed
giant ragweed
velvetleaf
common cocklebur
hedge bindweed
wild buckwheat
tall morningglory
climbing milkweed
spreading dogbane
treacle mustard
swamp smartweed
field pennycress
little barley
downy brome
large crabgrass
giant foxtail
yellow foxtail
green foxtail

APPENDIX C

COMMON AND LATIN NAMES OF WEEDS
REFERRED TO IN STUDY

Common Names	Latin Names
annual smartweeds	Polygonum sp.
black sage	Salvia mellifera
blue vervain	Verbena hastata
buckbrush	Symphoricarpos orbiculatus
buffalobur	Solanum rostratum
bullnettle	Cnidoscalus stimulosus
bur ragweed	Franseria tomentosa and discolor
bush morningglory	Ipomoea leptophylla
Canada thistle	Cirsium arvense
cheat	Bromus secalinus
chicory	Cichorium intybus
climbing milkweed	Sarcostemma cyanchoides
common cocklebur	Xanthium pennsylvanicum
common dandelion	Taraxacum officinale
common gorse	Ulex europaeus
common lambsquarters	Chenopodium album
common milkweed	Asclepias syriaca
common nutsedge	Cyperus rotundus
common ragweed	Ambrosia artemisiifolia
common sunflower	Helianthus annuus
curly dock	Rumex crispus
curse	Clidemia hirta
downy brome	Bromus tectorum
field bindweed	Convolvulus arvensis

Common Names	Latin Names
field horsetail	Equisetum arvense
field pennycress	Thlaspi arvense
giant foxtail	Setaria faberii
giant ragweed	Ambrosia trifida
green foxtail	Setaria viridis
groundcherry	Physalis sp.
halogoton	Halogoton glomeratus
hedge bindweed	Convolvulus sepium
hoary cress	Cardaris draba
horse nettle	Solanum carolinense
Indian rushpea	Hoffmannseggia densiflora
ivyleaf morningglory	Ipomoea hederacea
jimsonweed	Datura stramonium
Johnsongrass	Sorghum haleponse
jointed goatgrass	Aegilops cylindrica
kochia	Kochia scoparia
large crabgrass	Digitaria sanguinalis
leafy spurge	Euphorbia esula
little barley	Hordeum pussillum
manuka	Leptospermum scoparium
mayweed	Anthemis cotula
meadow salsify	Tragopogon pratensis
Missouri goldenrod	Solidago missouriensis
musk thistle	Carduus nutans
oxeye daisy	Chrysanthemum leucanthemum

Common Names	Latin Names
pasture thistle	Cirsium pumilum
Pennsylvania smartweed	Polygonum pennsylvanicum
pepperweed	Lepidium sp.
perennial sowthistle	Sonchus arvensis
piripiri	Acaena sanguisorbae
poison ivy	Rhus radicans
pricklypear	Opuntia sp.
puncturevine	Tribulus terrestris
quackgrass	Agropyron repens
redroot pigweed	Amaranthus retroflexus
Russian knapweed	Centaurea repens
Scotch broom	Cytisus scoparius
sedge	Carex sp.
shattercane	Sorghum sp.
smooth dandelion	Taraxacum erythrospermum
smooth pigweed	Amaranthus hybridus
smooth sumac	Rhus glabra
spanishneedles	Bidens bipinnata
spreading dogbane	Apocynum androsaemifolium
St. Johnswort	Hypericum perforatum
swamp smartweed	Polygonum coccineum
tall morningglory	Ipomoea purpurea
tansy ragwort	Senecio jacobaea
treacle mustard	Erysimum repandum
velvetleaf	Abutilon theophrasti

Common Names	Latin Names
Venice mallow	Hibiscus trionum
western ironweed	Vernonia baldwini
western whorled milkweed	Asclepias verticillata
western yarrow	Achillea lanulosa
wild barley	Hordeum leporinum
wild buckwheat	Polygonum convolvulus
wild carrot	Daucus carota
wild mustard	Brassica kaber
wild onion	Allium canadense
wild parsnip	Pastinacea sativa
witchweed	Striga lutea
yellow foxtail	Setaria glauca
yellow rocket	Barbarea vulgaris

APPENDIX D

COMMON AND ASSOCIATED TRADE NAMES OF CHEMICALS REFERRED TO IN STUDY

These names were listed here to show some of the associated trade names of chemicals which are oftentimes confused with the common names. The associated trade names do not imply that they were the only trade names nor were necessarily the best ones.

Common Names of Chemicals	Common Associated Trade Names
amiben	Amiben and Vegiben
amitrole	Amino-Triazole
ammonium sulfomate	Ammate
arsonate	Arsonate
atrazine	Atrazine or Atrazine 80W or Atratol 8P
calcium arsenate	various
CDAA	Randox
CDAA plus TCBC	Randox-T
chlorate	Chlorate
CIPC	CIPC
dalapon	Dowpon
DCPA	Dacthal
diallate	Avadex
dicamba	Banvel D
dicamba plus 2,4-D	Banvel K
diquat	Diquat
diuron	Karmex
DNBP	DNBP or Premerge

Common Names of Chemicals	Common Associated Trade Names
endothall	Endothal
EPTC	Eptam
EPTC plus 2,4-D	Knoxweed
linuron	Lorox
maleic hydrazide	MH-30
MCPA	MCPA
methyl bromide	various
monuron	Telvar
norea	Herban
NPA	Alanap
paraquat	Paraquat
pentachlorophenol	PCP
picloram	Tordon
propachlor	Ramrod
propazine	Propazine or Propazine 80W
pyrazon	Pyrazon
simazine	Simazine 80W
sodium arsenite	various
sodium chlorate	various
sodium pentachlorophenate	PCP sodium salt
TCA	TCA
TCBA	TCBA
trichlorobenzoic acid	Benzabor or Benzac or TBA
trifluralin	Treflan
vernolate	Vernam

Common Names of Chemicals	Common Associated Trade Names
zytron	Zytron
2,4-D	2,4-D or Dacamine
2,4,5-T	2,4,5-T
2,4-D wax bar	Weed-Ag Bar
4-(2,4-DB)	Butyrac

APPENDIX E

THE
KANSAS

NOXIOUS WEED LAW

&

OFFICIAL
METHODS
&
REGULATIONS

KANSAS NOXIOUS WEED LAW

C. S. 1949, art. 13, ch. 2, as amended.

Sec. 2-1314. Control and eradication of field bindweed, Russian knapweed, hoary cress, Canada thistle, quackgrass, leafy spurge, bur ragweed, pignut, goatgrass and Johnson grass. It shall be the duty of persons, association of persons, the state highway commission, the boards of county commissioners, the township boards, school boards, drainage boards, the governing body of incorporated cities, railroad companies, and other transportation companies or corporations or their authorized agents and those supervising state-owned lands to control the spread of and to eradicate all weeds declared by legislative action to be noxious on all lands owned or supervised by them and to use such methods for that purpose and at such times as are approved and adopted by the state board of agriculture. The term noxious weeds shall mean field bindweed (*Convolvulus arvensis*), Russian knapweed (*Centaurea picris*), hoary cress (*Lepidium draba*), Canada thistle (*Cirsium arvense*), quackgrass (*Agropyron repens*), leafy spurge (*Euphorbia esula*), bur ragweed (*Franseria tomentosa, and discolor*), pignut (*Hoffmannseggia densiflora*), goatgrass (*Aegilops cylindrica*), Johnson grass (*Sorghum halepense*), and musk (nodding) thistle (*Carduus nutans* L.).

Sec. 2-1314a. Same; weeds not declared noxious. County commissioners, township boards and city officials shall have the power to co-operate with landowners in their respective jurisdictions in the treatment and eradication of weeds, which have not been declared noxious by legislative action. Chemicals and labor used in the treatment of weeds as authorized by this section shall be supplied by the county, township or city to the landowner at actual cost, and equipment and machinery so used shall be charged at the actual cost of operation.

Sec. 2-1315. Methods; rules and regulations; federal co-operation. The state board of agriculture is hereby empowered to decide and adopt methods as official for control and eradication of noxious weeds and to publish such methods, and to make and publish such rules and regulations as in its judgment are necessary to carry into effect the provisions of this act, and to alter or suspend such rules and regulations when necessary. There is hereby created within the state board of agriculture a noxious weeds division which shall consist of a director, assistant directors and other employees as provided in this act. The state board of agriculture is authorized to appoint a director of the noxious weeds division and fix his salary, and such director shall be the executive officer thereof and shall be under the supervision of the secretary of the board. The state board of agriculture may establish not to exceed five (5) noxious weed control districts within this state and define bounda-

ries thereof, such districts to be constituted to provide for the most efficient control and eradication of noxious weeds and for the most economical supervision thereof by the state. The director, with the approval of the board, shall appoint an assistant state weed control director for each district so established; and it shall be the duty of each such assistant to consult, advise, render assistance and direction to county and city weed supervisors as to the best and most practical methods of noxious weed control and eradication and to render every possible assistance and direction to such supervisors for the most effective control and eradication of noxious weeds; to aid in investigations and prosecutions of violations of this act; and to prepare such records and reports and to perform such other services and duties as the state weed control director shall direct. The assistant director shall reside in the district for which he is appointed during the time he shall serve as such assistant director. The director, with the approval of the board of agriculture, may also appoint such additional assistants and clerical employees as may be deemed necessary to properly conduct the work of the noxious weeds division. It shall be the duty of the county agricultural agent to co-operate with and assist the county weed supervisors in an intensive educational program on weed control. The director of the noxious weeds division of the state board of agriculture shall enforce the rules and regulations of the board and all provision of this act and acts amendatory and supplemental thereto. The state board of agriculture is hereby authorized to enter into agreements with any agencies of the federal government for co-operation in the control and eradication of noxious weeds in Kansas in keeping with the provisions of this act.

Sec. 2-1316. Weed supervisors; duties; salary; how borne; reports. The board of county commissioners of each county shall, and the governing body of any incorporated city or any group of counties or cities may, employ for a stated time each year, with the approval of the secretary of the state board of agriculture, a competent person as county, city or district weed supervisor. The weed supervisor shall co-operate with the county assessor and deputy assessor in locating infestations of noxious weeds; consult and co-operate with the state division of noxious weeds and with the assistant weed control director appointed for his district; make annual surveys of infestations (compile data on areas eradicated and under treatment), and submit reports thereof to the county commissioners and to the state division of noxious weeds; to consult and advise upon all matters pertaining to the best and most practical methods for noxious weed control and eradication and to render every possible assistance and direction for the most effective control and eradication within his district; investigate or aid in the investigation and prosecution of any violation of this act and report violations of which he has knowledge to the county attorney. The salary of said county weed supervisor shall be borne as follows: The state

board of agriculture to pay not more than one-fourth thereof from any funds available, not less than three-fourths thereof to be paid out of the county noxious weed fund, prorated as may be decided at the time of such employment by the governing body or bodies employing such supervisor. The boards of county commissioners, governing bodies of cities and township boards, with the aid of their weed supervisors, shall make by January fifteenth each year an annual weed eradication progress report to the state board of agriculture for the preceding calendar year, on a form supplied by the state board, and such other weed reports as requested by said board or its duly authorized representative.

Sec. 2-1317. Conferences; report to state board; duty of landowner. The secretary of the state board of agriculture or his duly authorized representative and the local district or county weed supervisor shall confer, at such time or times as seems necessary and advisable, with persons and associations of persons, the state highway commission, the board of county commissioners, the township boards or other boards and the governing body of cities, railroad companies or other corporations, or their authorized agents, as to the extent of noxious weed infestation on their lands, and the methods deemed best suited to the control and eradication of each kind of noxious weeds within their respective jurisdictions. The county commissioners and the governing body of cities, shall report to the secretary of the state board of agriculture as to the extent and the official methods of control and eradication of noxious weeds to be undertaken in any one season in their jurisdiction, subject to the approval of said secretary: *Provided*, That in areas of heavy infestation of noxious weeds, where extensive eradication is not immediately possible without unreasonable expense, it shall be the duty of any person owning or supervising land which is so infested with noxious weeds to assist in keeping the same from spreading or infesting adjoining property, and to use official methods adopted by the state board of agriculture to control and eradicate such noxious weeds; and during the period of time when such approved methods of control and eradication are being employed he shall maintain a strip of land not less than one rod in width along the outer edge of the land owned or supervised by him free from all visible noxious weed vegetation or growth.

Sec. 2-1318. County assessor's duties; tax levies by counties, townships and cities; warrant against fund. The county assessor of each county, or any one when acting in the capacity of county assessor, is hereby directed and it shall be his duty to ascertain each year the approximate amount of land and highways infested with each kind of noxious weeds and its location in his county, and transmit such information tabulated by cities and townships, not later than June 1 of each year, to the county weed supervisor, secretary of the state board of agriculture, board of county commissioners, and to the governing body of each city and township in his district

pertaining to such noxious weed infestation in their respective jurisdiction. On the basis of such information the tax levying body of each county, township or incorporated city shall make a tax levy each year for the purpose of paying their part of the cost of control and eradication thereof as provided in this act: *Provided, however,* That each county, city, and township, separately, shall make a levy each year in addition to all other levies now authorized by law, in such amount as is deemed to be necessary but not to exceed one mill in any one year. Moneys collected from such levy shall be set apart as a noxious weed eradication fund and warrants duly verified by the county or city supervisor if such be employed or if no supervisor be employed, then by county, township or city clerk, as the case may be, may be drawn against this fund for all items of expense incident to control of noxious weeds in such district respectively.

Sec. 2-1319. Costs, how paid. The cost of controlling and eradicating noxious weeds on all lands or highways owned or supervised by a state agency, department or commission shall be paid by the state agency, department or commission supervising such lands or highways out of funds appropriated to its use; on county lands and county roads, on township lands and township roads, on city lands, streets and alleys by the county, township or city in which such lands, roads, streets and alleys are located, and out of funds made available for that purpose, on drainage districts, irrigation districts, cemetery associations and other political subdivisions of the state, the costs shall be paid out of their respective funds made available for the purpose. If the governing body of any political subdivision owning or supervising lands infested with noxious weeds within their jurisdiction shall fail to endeavor to control such noxious weeds after fifteen (15) days notice directing any such body to do so, the board of county commissioners shall proceed to have proper control and eradication methods used upon such lands, and shall notify the governing body of the political subdivisions by certified mail of the costs of such operations, with a demand for payment. The governing body of the political subdivision shall pay such costs from its noxious weed fund, or if no such fund is available, from its general fund or from any other funds available for such purpose. Copy of the statement, together with proof of notification, shall at the same time be filed with the county clerk, and if the amount is not paid within thirty (30) days, the same clerk shall spread the amount upon the tax roll of the subdivision, and said amount shall become a lien against the entire territory located within the particular political subdivision, and shall be collected as other taxes are collected. All moneys collected pursuant to this section shall be paid into the county noxious weed eradication fund. Tax levies made pursuant to this section shall be in addition to all other levies authorized by law, and shall be in addition to any aggregate tax levy limits prescribed by law. The words "governing

body" as used herein shall mean the board, body, or persons in which the powers of a political subdivision as a body corporate are vested; and the words "political subdivision" shall mean any agency or unit of the state which now is, or shall hereafter be, authorized to levy taxes or empowered to cause taxes to be levied. On all other lands the owner thereof shall pay the cost of control and eradication of noxious weeds: *Provided*, That chemical materials for use on privately owned lands may be purchased from the board of county commissioners at one-half the total cost thereof: *Provided further*, That whenever official methods of eradication, adopted by the state board of agriculture, are not followed in applying the chemical materials so purchased, the board of county commissioners may collect the additional one-half of the cost thereof.

Sec. 2-1320. Notice of noncompliance with act; entry upon land; itemized statement of cost; lien upon land; limitation. When a board of county commissioners or the governing body of a city has knowledge than any person, association of persons or corporation owning or supervising land infested with noxious weeds in their respective jurisdiction has failed in any current year to comply with this act in the control and eradication of such weeds thereon, the county commissioners, the governing officials of the city, the county or district weed supervisor, shall give written notice of that evidence to the owner or agent thereof, and such notice shall state that unless he or they proceed at a proper time as specified in said notice to earnestly endeavor to control said noxious weeds on his or their land according to methods set out by the board of agriculture, the county commissioners or governing body of the city, as the case may be, will after fifteen (15) days from the date specified in said notice enter or cause to be entered upon his or their land as often thereafter as is necessary and use such approved methods as may be best adapted for that particular plot of ground to control and eradicate such noxious weeds thereupon. If the owner or agent thereof fails to use such methods at the proper time the county commissioners, county weed supervisor, governing body of the city, or city weed supervisor, if such is employed, shall proceed to enter upon said land and use such methods to control and eradicate such noxious weeds with as little damage to other crops and property as possible. In case the county weed supervisor or city weed supervisor enters upon land to control such noxious weeds or in case of any unpaid accounts outstanding by December 31 of each year, the county commissioners or governing body of the city shall immediately notify or cause to be notified, said landowner or owners with an itemized statement as to the cost of material, labor and use of equipment and further stating that if the amount of said statement be not paid to the county or city treasurer wherein said real estate is located within thirty (30) days from the date of said notice, the amount thereof shall become a lien upon said real estate. Copy of said statement, together with the proof of notification, shall at

the same time be filed with the county or city clerk, as the case may be, and if said amount is not paid within the next thirty (30) days the said county or city clerk, as the case may be, shall spread the amount of said statement upon the tax roll prepared by him and said amount shall become a lien against the entire contiguous tract of land owned by such person or persons of which the portion so treated is all or a part, and shall be collected as other taxes are collected: *Provided*, That not more than five percent (5%) of the assessed valuation of the entire contiguous tract of land of which the portion so treated is all or a part shall be spread on the tax rolls against said land in any one year.

Sec. 2-1321. **Filing of protests; hearings; appeals.** If any person shall be dissatisfied with the charge made for material or rent of equipment used in the control and eradication of noxious weeds, he shall, within ten days from the mailing of the account showing such charge, file a protest with the board of county commissioners, who shall hold a hearing thereon and shall have the power to either adjust or affirm such charge. If any person shall be dissatisfied with the decision rendered by the board of county commissioners he shall within thirty days file a written notice of appeal with the clerk of the district court of the county and thereupon an action shall be docketed in the district court and be tried the same as other actions. Upon the final determination of any change in the account, if any, the county or city clerk shall correct the records in his office in accordance therewith.

Sec. 2-1322. **Equipment and chemical materials; charges for costs; records.** The board of county commissioners, or the governing body of incorporated cities, co-operating with the secretary of the state board of agriculture, shall purchase or provide for needed and necessary equipment and necessary chemical material for the control and eradication of noxious weeds. The board of county commissioners of any county or the governing body of any city may use any equipment or materials purchased as provided for in this section, upon the highways, streets and alleys, for the treatment and eradication of weeds which have not been declared noxious by legislative action. The board of county commissioners shall sell chemical material to the landowners in their jurisdiction at one-half the cost thereof, and may make such charge for the use of machines or other equipment and operators as may be deemed by them sufficient to cover the actual cost of operation: *Provided, however*, Whenever official methods of eradication adopted by the state board of agriculture are not used in applying the chemical material purchased, the board of county commissioners may collect the additional one-half of the cost thereof from the landowner. The board of county commissioners, township boards, and the governing body of cities shall keep a record showing purchases of material and equipment for control and eradication of noxious weeds. The board of county commissioners and the governing body of cities shall also keep a

complete itemized record showing sales for cash or charge sales of material and shall maintain a record of charges and receipts for use of equipment owned by each county or city on public and private land. Such records shall be open to inspection by citizens of Kansas at all times.

Sec. 2-1323. Penalty for violating provisions of act. Any person, association of persons, corporation, county or city or other official who shall violate or fail to comply with any of the provisions of this act and acts amendatory thereof or supplemental thereto shall be guilty of a misdemeanor and shall be punished upon conviction thereof by a fine of not less than fifty dollars ($50) nor more than five hundred dollars ($500) for each count.

Sec. 2-1324. Invalidity of part. Should it be decided upon final judicial hearing that any section or clause of this act is invalid such decision shall only apply to the section or clause so found to be invalid and shall not invalidate the entire act.

Sec. 2-1325. Unlawful acts; disposal of screenings and materials. It shall be unlawful for any person, company or corporation to sell, offer for sale, barter, give away or otherwise dispose of any screening or offal material containing seeds of weeds mentioned in section 1 (2-1314) of this act unless such screenings and materials shall first have been processed by grinding or other adequate means, and the viability of all such weed seeds therein destroyed, provided unprocessed screenings or offal material may be sold to a commercial processor or commercial feed mixer for processing.

Sec. 2-1326. Same; disposal of infested plants, materials or fertilizers. It shall be unlawful for any person, company, or corporation to sell, barter or give away nursery stock, plants, packing material, animal fertilizer and soil or sod for landscaping or fertilizer uses which contains or is infested with noxious weed plant material or seeds.

Sec. 2-1327. Same; harvesting and other machines; labeling. It shall be unlawful for any person, company or corporation to (1) bring any harvesting or threshing machinery, portable feed grinders, portable seed cleaners, or field ensilage cutters or other farm vehicles or machinery into the state without first cleaning such equipment free from all weed seed and litter, or (2) to move any harvesting or threshing machines, portable feed grinders, portable seed cleaners, or field ensilage cutters from any field or farm infested with any noxious weed without first cleaning such equipment free from all weed seed and litter. Each such machine operated by a person doing work for another shall be labeled with an appropriate label on a form provided by the state board of agriculture containing this section of the law.

Sec. 2-1328. Same; infested livestock feed material. It shall be unlawful for any person, company or corporation to sell or offer for sale, barter or give away any livestock feed material which is

infested with seeds of noxious weeds unless such feed material shall first have been processed and the viability of all noxious weed seeds present therein destroyed, except such feeds (1) may be sold for consumption on the same farm where grown or (2) may be sold to commercial processors or commercial feed mixers.

Sec. 2-1329. Same; unprocessed livestock feed. It shall be unlawful for any person, company or corporation to feed to livestock, except on the premises where grown or when purchased from a grower or dealer within the state, any grains, crops or other material containing the seeds of noxious weeds, without first having processed same as to destroy the viability of all such weed seeds.

Sec. 2-1330. Entry upon land and inspection. County commissioners, township boards, city officials and state, county and city weed supervisors shall have at all reasonable times, free access to enter upon premises and to inspect property, both real and personal, regardless of location, in connection with the administration of the state weed law.

MUSK THISTLE

The most important rule of all for using agricultural chemicals is to READ THE LABEL carefully each time the chemical is used, and then follow directions exactly.

Official Methods and Regulations Pertaining to the Control and Eradication of Noxious Weeds

4-S-10 DEFINITIONS

4-S-10.1 INFESTED AREAS

The term "infested areas" shall be construed as extending one rod beyond the visible boundaries as evidenced by the growth of the weeds, and any of the official methods for the control and eradication shall be applied accordingly.

4-S-11
FIELD BINDWEED
(Convolvulus arvensis)

4-S-11.1 CULTIVATION AND CROPPING

4-S-11.1.1 **Cultivation.** Cultivation of field bindweed infested areas as hereinafter set forth, may begin any time during the growing season, and shall be done in such manner as to cut off all the weed plants at each operation. Cultivations shall be 3 to 5 inches deep at intervals of 14 to 18 days. When the weeds have been so weakened that they emerge more slowly, the cultivation intervals may be extended to such time as will permit the weeds to grow not more than 10 days after each emergence of first plants, but not to exceed intervals of 3 weeks. Cultivation shall be continued until the weeds have been eradicated or have been suppressed to such extent that remaining plants may be more economically destroyed by other treatment, as the application of approved chemicals to individual plants or by hand cultivation.

4-S-11.1.2 **Smother Crop.** The infested land under cultivation by approved methods for a period beginning either (a) in the spring, or (b) after small grain harvest of the preceding year, may be seeded to an adapted variety of forage sorghum (cane or sudan as a smother crop, by close drilling such sorghum or sudan seed about

July 1. In either case such smother crop shall not be pastured nor harvested until after the first heavy (plant killing) frost. Upon the appearance of weed growth the following spring eradication by approved methods shall be resumed and continued until eradication is completed. If an effective stand and growth of smother crop is not obtained from such seeding, cultivation by approved methods shall be promptly resumed.

4-S-11.1.3 **Alternate Fallow and Crop.** The infested land may be seeded to wheat, rye or winter barley by late fall sowing following continuous cultivation by approved methods for a period beginning not later than weed growth in the spring. Such land must be cultivated by approved methods immediately before sowing. The time of seeding shall not be earlier than September 15 and shall coincide with the Hessian fly-free dates in the various counties, ranging from September 15 in northwestern Kansas to October 15 in southeastern Kansas. Immediately following harvest of such seeded crops, cultivation by approved methods shall be resumed until weed eradication is completed.

4-S-11.1.4 **Winter Cover Crop.** The infested land under cultivation by approved methods may be seeded to small grain for winter cover to prevent and control wind and water erosion, by fall sowing in accordance with dates specified in regulation number 4-S-11.2.1.6. All such winter cover seedings shall be destroyed and cultivated by approved methods resumed in the following spring when weed growth starts. Such winter cover may be utilized as a pasture.

In yards, flower gardens, lawns and among trees and shrubbery, hoeing or other effective means of thoroughly cutting the weeds at regular intervals of not to exceed 14 days shall be construed as cultivation.

4-S-11.2 APPLICATION OF CHEMICALS

4-S-11.2.1 2,4-D.

4-S-11.2.1.1 **Time, Rate and Method of Application.** Application of 2,4-D in conjunction with cropping and cultivation, shall comply with following requirements:

a. Seeding of crop shall be delayed for two weeks or more after the first good rain received following 2,4-D treatment.

b. For each acre of field bindweed, application shall be at the rate of: ¾ to one pound of actual 2,4-D acid in any formulation if plant growth and moisture conditions correspond to subsection d.

c. The amount of actual 2,4-D acid shall be calculated only on the basis of percent of 2,4-D in the product.

d. Treatment with 2,4-D shall be made when the weed plants are young, tender and in active growing condition, and when moisture in soil is ample to promote plant growth.

4-S-11.2.1.2 **Treatment After Bindweed Killing Frost.** Treatment by 2,4-D in the fall after a bindweed killing frost (20° F.) is not approved.

4-S-11.2.1.3 **Field Bindweed on Crop Land.** Field bindweed growing on crop land in large areas, where treatment by use of soil sterilants is impractical, may be treated by applications of 2,4-D. The use of 2,4-D under such conditions will more effectively assist in eradication of field bindweed when combined with approved competitive crops and intensive cultivation. Such approved cropping and cultivation procedures are as follows:

4-S-11.2.1.3.1 **Where Winter Grain Crop Is To Be Seeded.** Treat field bindweed with 2,4-D and delay fall seeding of grain crop for at least two weeks after first good rain, following treatment. If bindweed regrowth remains after harvest of crop, cultivate infested areas in accordance with regulation number 4-S-11.2.1.6 until fall seeding of grain crop, or treat with 2,4-D and delay seeding of next crop for at least two weeks following first good rain after treatment. Continue 2,4-D treatment, cultivation and cropping until eradication is complete.

4-S-11.2.1.3.2 **Where Spring Crop Is To Be Seeded.** Treat field bindweed with 2,4-D about October 1, and seed to oats or barley in following spring. If bindweed regrowth remains after harvest of grain crop, cultivate infested areas in accordance with regulation number 4-S-11.2.1.6 until seeding of fall or spring grain crop or (1) treat with 2,4-D and delay fall seeding of next crop for at least two weeks following first good rain after treatment, or (2) treat with 2,4-D about October 1, and seed oats or barley the following spring. Continue 2,4-D treatment, cultivation and cropping until eradication is complete.

4-S-11.2.1.3.3 **Where Sorghum Crops Are To Be Seeded.** Treat field bindweed with 2,4-D in the fall or in the spring when the bindweed plant is in bud or early bloom and follow with seeding of infested areas to a close drilled sorghum crop. If 2,4-D treatment is applied in the fall, soybeans may be planted in narrow spaced rows the following spring.

4-S-11.2.1.3.4 **Substitution of 2,4-D Treatment for Intensive Cultivation.** (a) Bindweed may be treated with 2,4-D in the spring just before full bloom and the land cultivated each two weeks after bindweed regrowth starts until fall seeding of crop. If bindweed regrowth is present after the harvest of crop the following year, cultivate infested areas in accordance with regulation number 4-S-11.2.1.6 until fall seeding of grain crop or treat with 2,4-D and delay fall seeding of grain crop for at least two weeks after first good rain following treatment. (b) Spraying bindweed with 2,4-D in the spring just before full bloom and again in late summer or fall may be substituted for a season of intensive cultivation. The fall seeding of grain crop shall be withheld until at least two weeks, following first good rain, after 2,4-D treatment. If fall regrowth of bindweed is not adequate or suitable for retreatment with 2,4-D, cultiva-

tion should be continued and infested land seeded to fall grain crop. If suitable rain is not secured following fall treatment with 2,4-D, the fall seeding of crop should not be made and oats, barley or sorghums should be seeded the next spring. The land shall be cultivated once in early spring to kill volunteer crops and early annual weed growth, and where necessary, once or more between 2,4-D spray treatment to kill grass type weeds and to conserve moisture for the second 2,4-D treatment. At least one month shall elapse following cultivation and before application of 2,4-D. If bindweed regrowth is present after harvest of crop, cultivate infested areas in accordance with regulation number 4-S-11.2.1.6 until fall seeding of grain crop, or treat with 2,4-D and delay seeding of crop for at least two weeks after first good rain following treatment.

4-S-11.2.1.3.5 **Where Intensive Cultivation Precedes 2,4-D Treatment.** Where cultivation of areas infested with field bindweed is started in the spring and continued until about September 1 in accordance with regulation number 4-S-11.2.1.6, treat with 2,4-D about October 1 to 15 and seed to oats or barley the following spring. If bindweed growth remains after harvest of such crop, continue cultivation until fall seeding of grain crop, or treat with 2,4-D and delay fall seeding of crop for at least two weeks after first good rain following treatment.

4-S-11.2.1.4 **Field Bindweed on Grass Land.** Field bindweed growing in good stands of perennial grass shall be treated by applications of 2,4-D. Retreatment of infested areas is required until eradication is complete.

4-S-11.2.1.4.1 **Seeding to Grass.** Land infested with field bindweed may be treated in the fall with 2,4-D and seeded to a perennial grass in the spring. After grass is established, any field bindweed remaining shall be further treated with 2,4-D until eradicated.

4-S-11.2.1.5 **Desirable and Undesirable Crops in 2,4-D Weed Control Methods.** Desirable crops in 2,4-D weed control methods include wheat, barley, oats, rye, close-drilled sudan grass, sorghums, soybeans. Undesirable crops include flax or any crop planted in wide spaced rows. Sensitive crops shall not be used with 2,4-D.

4-S-11.2.1.6 **Approved Cultivation.** Intensive cultivation of bindweed in connection with the use of 2,4-D for eradication consists of the use of a duckfoot or blade-type implement which will sever all weed roots as the ground is worked. The ground shall be worked 3 to 5 inches deep at intervals of two weeks. Sweeps and blades shall be kept sharp and no skips made.

4-S-11.2.2. **Sodium Chlorate.** Sodium chlorate and proved mixtures thereof shall be applied to field bindweed, preferably in the dry form. This chemical shall be applied evenly once during the season, at the rate of 5 to 6 pounds per square rod in spring months

up to July 1, and 4 to 5 pounds after August 1. Retreatment shall be made as necessary, beginning the second spring after the original treatment.

4-S-11.2.3 Boron Compounds and Mixtures of Borates and Sodium Chlorate. The application of dry sodium borate materials shall be at the rate of 10 to 11 pounds boron trioxide (B_2O_3) equivalent per square rod. (This is equal to 16 to 17 pounds of a 65% material.)

Rates of mixtures of soluble borate and sodium chlorate shall be at 8 to 10 pounds per square rod. This would include combinations such as 49% B_2O_3 equivalent and 25% sodium chlorate, or 23.3% B_2O_3 and 30% sodium chlorate. The above rates would apply to either the dry form or applied as a spray.

4-S-11.2.5 Monuron. Monuron is approved for treatment of field bindweed at rates of 64 to 96 pounds active ingredient per acre. This is equivalent to ½ to ¾ pound of an 80 percent formulation per square rod. For applications as a wettable powder, Monuron shall be mixed with not less than 2 gallons of water for each pound of Monuron.

4-S-11.2.6 A mixture of approximately 94% disodium tetraborate and 4% monuron (3-(p-chlorophenyl)-1-1-dimethlyurea) applied at the rate of 6 to 8 pounds per square rod.

4-S-11.2.7 A mixture of approximately 57% sodium metaborate and 40% sodium chlorate and 1% monuron (3-(p-chlorophenyl)-1-1-dimethylurea) applied at the rate of 8 to 10 pounds per square rod.

4-S-11.2.8 Trichlorobenzoic acid (TBA). A chemical whose active trichlorobenzoic acid ingredient contains approximately 50% 2,3,6 trichlorobenzoic acid (2,3,6 TBA) in combination with other trichlorobenzoic acid isomers applied at 16 to 20 pounds acid equivalent per acre is approved for control of field bindweed and may be applied in liquid or granular form.

4-S-11.2.9 Polychlorobenzoic acid (PBA). A mixture of primarily dichloro, trichloro, and tetrachloro benzoic acids applied at 32 to 40 pounds acid equivalent per acre is approved for control of field bindweed and may be applied in liquid or granular form.

4-S-11.2.10 Fenac. Applied at 15 to 20 pounds acid equivalent per acre is approved for control of field bindweed. Application can be made in liquid or granular form.

4-S-11.2.11 2,3,6-Trichlorobenzyloxypropanol. Applied at 16 to 20 pounds acid equivalent per acre is approved for control of field bindweed. Application can be made in liquid or granular form.

Treat all chemicals as potentially dangerous if used without proper knowledge and caution.

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4-S-12

JOHNSON GRASS

(Sorghum halepense)

4-S-12.1 CULTIVATION AND SMALL GRAINS

The following cultural methods are approved for use: (1) Cultivation with a tool which will cut all plants at each operation at 3 to 5 inches deep, may start any time during the growing season and be continued at intervals of each 14 to 21 days until eradication is completed. (2) A combination of small grains and intensive cultivation may be used, provided the cultivation is performed as described above for Johnson grass, and begins immediately after harvest and continues through the remainder of the growing season or until fall seeding of small grains. Summer growing crops are not satisfactory for controlling Johnson grass. (3) Close graze all season or mow at 2 or 3 week intervals through the growing season. Follow by late fall plowing and leave land rough through the winter.

4-S-12.2 APPLICATION OF CHEMICALS

4-S-12.2.1 Sodium Chlorate. For Johnson grass, this chemical shall be applied at the rate of 4 pounds per square rod in the spring months, or 3 pounds per square rod in the fall months, preferably in the dry form. Any surviving plants shall be retreated with sodium chlorate until eradicated. Dense growth and trash should be removed before applying the sodium chlorate.

4-S-12.2.2. TCA. TCA is adopted for treatment of Johnson grass according to approved methods as follows: TCA shall be applied to small areas, generally not exceeding one-half acre in size at the rate of one-half to 1 pound acid equivalent per square rod in fall or spring. Where possible, material should be applied before emergence of Johnson grass in spring. Dense top growth should be removed before applying. TCA shall be uniformly applied as a spray solution, with the required amount of the material in 1 to 2 gallons of water per square rod.

4-S-12.2.3 Boron Compounds and Mixtures of Borates and Sodium Chlorate. The application of dry sodium borate materials

Leafy Spurge

Russian Knapweed

Canada Thistle

Giant

shall be at the rate of 10 to 11 pounds boron trioxide (B_2O_3) equivalent per square rod. (This is equal to 16 to 17 pounds of a 65% material.)

Rates of mixtures of soluble borate and sodium chlorate shall be at 8 to 10 pounds per square rod. This would include combinations such as 49% B_2O_3 equivalent and 25% sodium chlorate, or 23.3% B_2O_3 and 30% sodium chlorate. The above rates would apply to either the dry form or applied as a spray.

4-8-12.2.5 Dalapon. Apply 20 to 30 pounds per acre of a material containing 74 percent 2,2 dichloropropionic acid equivalent when the Johnson grass plants are 12 to 24 inches tall, or apply 10 to 15 pounds of this material to Johnson grass when 12 to 24 inches tall and make a second application of 7½ to 10 pounds per acre 15 to 30 days later. For treating small patches, use 1 pound of 2,2 dichloropropionic acid (Dalapon) per 5 gallons of water and apply to the point of run-off.

4-8-12.2.6 Erbon. Apply one-half pound of 2-(2,4,5 trichlorophenoxy) ethyl 2,2 dichloropropionate (Erbon) per square rod to Johnson grass which is actively growing and from 6 to 18 inches in height. A minimum of one-half gallon of water per square rod must be used.

4-8-12.2.7 A mixture of approximately 94% disodium tetraborate and 4% monuron (3-(p-chlorophenyl)-1-1-dimethylurea) applied at the rate of 6 to 8 pounds per square rod.

4-8-12.2.8 A mixture of approximately 57% sodium metaborate and 40% sodium chlorate and 1% monuron (3-chlorophenyl) -1-1 dimethylurea) applied at the rate of 8 to 10 pounds per square rod.

4-8-13

HOARY CRESS

(Lepidium draba)

4-8-13.1 CHEMICAL TREATMENT

4-8-13.1.1 Since hoary cress is highly tolerant to sodium chlorate, it shall be controlled by repeated use of 2,4-D (2,4-dichlorophenoxyacetic acid) without limitations as to location of area or size of in-

festations. Where possible, infested areas may be seeded to a perennial sod grass and followed by 2,4-D treatment. Applications of 2,4-D should be made when the weed is in early bloom stage and, where growth permits, in the fall rosette stage. Rate of application should be 2 pounds per acre of acid equivalent in ester form applied when the weed is in tender and active growing condition.

4-S-13.1.4 **Fenac.** Applied at 15 to 20 pounds acid equivalent per acre is approved for control of hoary cress. Application can be made in liquid or granular form.

4-S-13.1.5 **2,3,6-Trichlorobenzyloxypropanol.** Applied at 16 to 20 pounds acid equivalent per acre is approved for control of hoary cress. Application can be made in liquid or granular form.

4-S-14
RUSSIAN KNAPWEED
(Centaurea picris)

4-S-14.1 CHEMICAL TREATMENT

4-S-14.1.1 **Sodium Chlorate.** This chemical shall be applied evenly once during the season, at the rate of 5 to 6 pounds per square rod in spring months up to July 1, and 4 to 5 pounds after August 1. Retreatments shall be made as necessary, beginning the second spring after the original treatment. Any surviving plants shall be retreated with sodium chlorate until eradicated. Dense growth and trash should be removed before applying the sodium chlorate.

4-S-14.1.2 **Boron Compounds and Mixtures of Borates and Sodium Chlorate.** The application of dry sodium borate materials shall be at the rate of 10 to 11 pounds boron trioxide (B_2O_3) equivalent per square rod. (This is equal to 16 to 17 pounds of a 65% material.)

Rates of mixtures of soluble borate and sodium chlorate shall be at 8 to 10 pounds per square rod. This would include combinations such as 49% B_2O_3 equivalent and 25% sodium chlorate, or 23.8% B_2O_3 and 30% sodium chlorate. The above rates would apply to either the dry form or applied as a spray.

4-S-14.1.3 Trichlorobenzoic acid (TBA). A chemical whose active trichlorobenzoic acid ingredient contains approximately 50% 2,3,6 trichlorobenzoic acid (2,3,6 TBA) in combination with other trichlorobenzoic acid isomers applied at 16 to 20 pounds acid equivalent per acre is approved for control of Russian knapweed and may be applied in liquid or granular form.

4-S-14.1.4 Polychlorobenzoic acid (PBA). A mixture of primarily dichloro, trichloro, and tetrachloro benzoic acids applied at 32 to 40 pounds acid equivalent per acre is approved for control of Russian knapweed and may be applied in liquid or granular form.

4-S-14.1.5 Fenac. Applied at 15 to 20 pounds acid equivalent per acre is approved for control of Russian knapweed. Application can be made in liquid or granular form.

4-S-14.1.6 2,3,6-Trichlorobenzyloxypropanol. Applied at 16 to 20 pounds acid equivalent per acre is approved for control of Russian knapweed. Application can be made in liquid or granular form.

4-S-17

BUR RAGWEED

(Franseria tomentosa, and discolor)

4-S-17.1 CULTIVATION AND CROPPING

4-S-17.1.1 Control of bur ragweed may be obtained by combining chemical and cultural treatments. Begin by treating with 2,4-D as outlined in section 4-S-17.2.1. Cultivate regrowth with a sweep-type or other suitable implement 8 to 10 days after emergence until fall. Seed a winter small grain. The following year cultivate immediately after harvest and continue cultivating 8 to 10 days after each emergence until fall. Except for the first cultivation after harvest, 2,4-D may be substituted for some of the tillage operations provided soil moisture is ample, and the bur ragweed is growing rapidly.

Most rapid stand reductions may be obtained by using alternate crop and fallow, but one year of fallow followed by two small grain crops may also be used.

4-S-17.2 APPLICATION OF CHEMICALS

4-S-17.2.1 2,4-D. Proper application of 2,4-D will reduce the density of bur ragweed stands, but the chemical cannot be relied upon to eradicate the weed.

For maximum stand reduction with 2,4-D apply an ester formulation at 2 pounds acid equivalent per acre in early summer (May 25 to June 20). Additional treatments in following years will be necessary to maintain control.

4-S-17.2.2 Sodium Chlorate. Sodium chlorate and proved mixtures thereof shall be applied to bur ragweed, preferably in the dry form. This chemical shall be applied evenly once during the season, at the rate of 5 to 6 pounds per square rod in spring months up to July 1, and 4 to 5 pounds after August 1. Retreatments shall be made as necessary, beginning the second spring after the original treatment.

4-S-17.2.3 Boron Compounds and Mixtures of Borates and Sodium Chlorate. The application of dry sodium borate materials shall be at the rate of 10 to 11 pounds boron trioxide (B_2O_3) equivalent per square rod. (This is equal to 16 to 17 pounds of a 63% material.)

Rates of mixtures of soluble borate and sodium chlorate shall be at 8 to 10 pounds per square rod. This would include combinations such as 49% B_2O_3 equivalent and 25% sodium chlorate, or 23.3% B_2O_3 and 30% sodium chlorate. The above rates would apply to either the dry form or applied as a spray.

4-S-17.2.4 Monuron. Monuron is approved for treatment of bur ragweed at rates of 64 to 96 pounds active ingredient per acre. This is equivalent to ½ to ¾ pound of an 80% formulation per square rod. For application as a wettable powder, Monuron shall be mixed with not less than 2 gallons of water for each pound of Monuron.

4-S-17.2.5 Trichlorobenzoic acid (TBA). A chemical whose active trichlorobenzoic acid ingredient contains approximately 50% 2,3,6 trichlorobenzoic (2,3,6 TBA) in combination with other trichlorobenzoic acid isomers applied at 16 to 20 pounds acid equivalent per acre is approved for control of bur ragweed and may be applied in liquid or granular form.

4-S-17.2.6 Polychlorobenzoic acid (PBA). A mixture of primarily dichloro, trichloro, and tetrachloro benzoic acids applied at 32 to 40 pounds acid equivalent per acre is approved for control of bur ragweed and may be applied in liquid or granular form.

4-S-17.2.7 Fenac. Applied at 15 to 20 pounds acid equivalent per acre is approved for control of bur ragweed. Application can be made in liquid or granular form.

4-S-17.2.8 2,3,6-Trichlorobenzyloxypropanol. Applied at 16 to 20 pounds acid equivalent per acre is approved for control of bur ragweed. Application can be made in liquid or granular form.

4-8-18

CANADA THISTLE

(Cirsium arvense)

4-8-18.1 CULTIVATION AND CROPPING

4-8-18.1.1 Intensive Cultivation. Intensive cultivation will eradicate Canada thistle. Cultivation should be from spring to late fall, or from immediately after small grain harvest until late fall the following year.

4-8-18.1.2 Combinations of cultivation, crops and chemicals. One season of intensive cultivation followed by winter wheat or winter rye will eradicate a high percentage of Canada thistle or bromegrass established in a thistle infested area sprayed with ¾ pound of actual 2,4-D acid per acre over a two-year period is an effective control.

4-8-18.2 APPLICATION OF CHEMICALS

4-8-18.2.1 2,4-D. One pound of actual 2,4-D acid per acre applied in the early bud stage will kill a high percentage of Canada thistle. A repeat application is necessary the following year. A spring and fall application made at the rosette stage will also give satisfactory results.

4-8-18.2.2 Amitrole. This chemical will eradicate Canada thistle when applied at rates of 4 to 6 pounds active ingredient per acre in the pre-bud stage. Amitrole can also be applied to regrowth of thistles (8 inches high to bud stage) when preceded by mowing or early plowing.

4-8-18.2.3 Sodium Chlorate. Sodium chlorate and proved mixtures thereof shall be applied to Canada thistle, preferably in the dry form. This chemical shall be applied evenly once during the season, at the rate of 5 to 6 pounds per square rod in spring months up to July 1, and 4 to 5 pounds after August 1. Retreatments shall be made as necessary, beginning the second spring after the original treatment.

4-8-18.2.4 Boron Compounds and Mixtures of Borates and Sodium Chlorate. The application of dry sodium borate materials shall be at the rate of 10 to 11 pounds boron trioxide (B_2O_3) equiv-

alent per square rod. (This is equal to 16 to 17 pounds of a 65% material.)

Rates of mixtures of soluble borate and sodium chlorate shall be at 8 to 10 pounds per square rod. This would include combinations such as 49% B_2O_3 equivalent and 25% sodium chlorate, or 23.3% B_2O_3 and 30% sodium chlorate. The above rates would apply to either the dry form or applied as a spray.

4-S-18.2.5 Monuron. Monuron is approved for treatment of Canada thistle at rates of 64 to 96 pounds active ingredient per acre. This is equivalent to ½ to ¾ pound of an 80% formulation per square rod. For application as a wettable powder, Monuron shall be mixed with not less than 2 gallons of water for each pound of Monuron.

4-S-18.2.6 Trichlorobenzoic acid (TBA). A chemical whose active trichlorobenzoic acid ingredient contains approximately 50% 2,3,6 trichlorobenzoic (2,3,6 TBA) in combination with other trichlorobenzoic acid isomers applied at 16 to 20 pounds acid equivalent per acre is approved for control of Canada thistle and may be applied in liquid or granular form.

4-S-18.2.7 Polychlorobenzoic acid (PBA). A mixture of primarily dichloro, trichloro, and tetrachloro benzoic acids applied at 32 to 40 pounds acid equivalent per acre is approved for control of Canada thistle and may be applied in liquid or granular form.

4-S-18.2.8 A mixture of approximately 94% disodium tetraborate and 4% monuron applied at the rate of 6 to 8 pounds per square rod.

4-S-18.2.9 A mixture of approximately 37% sodium metaborate and 40% sodium chlorate and 1% monuron applied at the rate of 8 to 10 pounds per square rod.

4-S-18.2.10 Fenac. Applied at 15 to 20 pounds acid equivalent per acre is approved for control of Canada thistle. Application can be made in liquid or granular form.

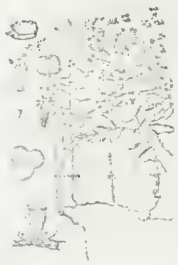
4-S-18.2.11 2,3,6-Trichlorobenzyloxypropanol. Applied at 16 to 20 pounds acid equivalent per acre is approved for control of Canada thistle. Application can be made in liquid or granular form

Store chemical materials in original containers and keep them tightly closed. Keep out of reach of children, pets and irresponsible people.

4-S-19

LEAFY SPURGE

(Euphorbia esula)



4-S-19.1 CULTIVATION AND CROPPING

4-S-19.1.1 **Intensive cultivation.** Cultivation every two weeks from the beginning of spring growth prior to August 1 and every three weeks thereafter is suggested. Cultivation should continue until late fall.

4-S-19.1.2 **Combinations of cultivation, crops and chemicals.** Intensive cultivation between harvest and sowing of winter wheat or rye will reduce the stand of leafy spurge. A spring application of 2,4-D ester at ½ pound actual acid per acre will increase the effectiveness of the cultivation-cropping combination.

One pound actual acid per acre of 2,4-D ester will control leafy spurge in established stands of brome and other cool season grasses. Intensive cultivation prior to fall seeding of cool season grasses will increase the effectiveness of 2,4-D.

4-S-19.2 APPLICATION OF CHEMICALS

4-S-19.2.1 **2,4-D.** An application of ¼ pound actual acid per acre of 2,4-D ester will prevent seed production and kill seedlings. Repeated applications of 1 pound actual acid per acre in the early bud stage are needed for eradication of established plants. 2,4-D is most effective when used in combination with cultivation and a competitive crop.

4-S-19.2.2 **Sodium Chlorate.** Sodium chlorate and proved mixtures thereof shall be applied to leafy spurge, preferably in the dry form. This chemical shall be applied evenly once during the season at the rate of 5 to 6 pounds per square rod in spring months up to July 1, and 4 to 5 pounds after August 1. Retreatments shall be made as necessary, beginning the second spring after the original treatment.

4-S-19.2.3 **Boron Compounds and Mixtures of Borates and Sodium Chlorate.** The application of dry sodium borate materials shall be at the rate of 10 to 11 pounds boron trioxide (B_2O_3) equiv-

alent per square rod. (This is equal to 16 to 17 pounds of a 63% material.)

Rates of mixtures of soluble borate and sodium chlorate shall be at 8 to 10 pounds per square rod. This would include combinations such as 49% B_2O_3 equivalent and 25% sodium chlorate, or 23.8% B_2O_3 and 30% sodium chlorate. The above rates would apply to either the dry form or applied as a spray.

4-8-19.2.4 Monuron. Monuron is approved for treatment of leafy spurge at rates of 64 to 96 pounds active ingredient per acre. This is equivalent to ½ to ¾ pound of an 80% formulation per square rod. For application as a wettable powder, Monuron shall be mixed with not less than 2 gallons of water for each pound of Monuron.

4-8-19.2.5 Trichlorobenzoic acid (TBA). A chemical whose active trichlorobenzoic acid ingredient contains approximately 50% 2,3,6 trichlorobenzoic (2,3,6 TBA) in combination with other trichlorobenzoic acid isomers applied at 16 to 20 pounds acid equivalent per acre is approved for control of leafy spurge and may be applied in liquid or granular form.

4-8-19.2.6 Polychlorobenzoic acid (PBA). A mixture of primarily dichloro, trichloro, and tetrachloro benzoic acids applied at 32 to 40 pounds acid equivalent per acre is approved for control of leafy spurge and may be applied in liquid or granular form.

4-8-19.2.7 A mixture of approximately 94% disodium tetraborate and 4% monuron applied at the rate of 6 to 8 pounds per square rod.

4-8-19.2.8 A mixture of approximately 57% sodium metaborate and 40% sodium chlorate and 1% monuron applied at the rate of 8 to 10 pounds per square rod.

4-8-19.2.9 Fenac. Applied at 15 to 20 pounds acid equivalent per acre is approved for control of leafy spurge. Application can be made in liquid or granular form.

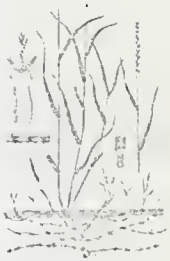
4-8-19.2.10 2,3,6-Trichlorobenzyloxypropanol. Applied at 16 to 20 pounds acid equivalent per acre is approved for control of leafy spurge. Application can be made in liquid or granular form.

Apply agricultural chemicals in the amounts specified and at the times specified in the label instructions. Don't spray on a windy day. If there is a breeze, work so that the spray blows away from you and anyone else in area.

4-8-20

QUACKGRASS

(Agropyron repens)



4-8-20.1 CULTIVATION AND CROPPING

4-8-20.1.1 Cultivation. Roots and rhizomes are readily killed by drying on the soil surface. Tillage with a heavy duty springtooth cultivator should be at a depth of 3 or 4 inches. The shovels of such an implement should be operated at a slightly lower depth for each successive cultivation. The first operation should be when growth starts in April. Succeeding cultivations should be made at intervals of about 1 week even though no growth of quackgrass is apparent.

Shallow cultivation or plowing in the late fall will expose rhizomes to freezing and drying during winter and reduces the stand and rapidity of spring growth. Intensive grazing before cultural operations are started is beneficial.

4-8-20.1.2 Competitive Crops. To be most effective, competitive crops should be planted only after the quackgrass has been partially weakened by tillage. Closely drilled stands of sudan-grass or forage sorghum may be used. In gardens, a relatively close spacing of squash or pumpkins is effective.

4-8-20.2 APPLICATION OF CHEMICALS

4-8-20.2.1 Dalapon. This chemical is most effective when applied to quackgrass from 4 to 8 inches tall. If growth occurs, fall treatments of 10 pounds per acre of a material containing 74% 2,2 dichloropropionic acid equivalent followed in 3 weeks by plowing or other tillage before freeze-up will give good control of quackgrass the following year. Crops planted in the spring on areas treated early in the fall generally are not affected from residues if normal rainfall occurs.

A spring application of 4 to 8 pounds per acre of dalapon when the plants are from 2 to 6 inches tall is effective. This treatment should be followed in 2 or 3 weeks by plowing. Spring applications will injure sensitive early planted crops. As a precaution such crops should not be planted until 4 weeks after application. Corn,

wheat, barley, and soybeans are especially sensitive to small amounts of dalapon in the soil. A single application of 10 pounds per acre of dalapon in the spring will give seasonal control of quackgrass in areas that cannot be cultivated. Repeated treatments will be necessary for complete eradication.

4-8-20.2.2 **Amitrole.** This chemical should be applied at 4 pounds active ingredient per acre when the quackgrass has good growth of new foliage but before heading. Applications may be made in either the spring or fall. Thorough tillage or plowing 2 or 3 weeks after treatment is essential. Best results occur on fertile soils or following fertilization of quackgrass with nitrogen to ensure a dense growth. Crops may be planted as soon as soil preparation is completed for amitrole leaves little or no toxic residue.

4-8-20.2.3 **Atrazine.** Where rainfall is adequate atrazine will eradicate quackgrass in combination with corn. A fall application of 4 pounds active ingredient per acre on mowed sod or a spring application of 3 pounds active ingredient per acre is effective when followed in three weeks by plowing. During seasons of low rainfall atrazine will give little or no control. Corn can be grown following atrazine, but other crops, particularly soybeans and oats will be seriously affected by residues.

4-8-20.2.4 **Sodium Chlorate.** Sodium chlorate and proved mixtures thereof shall be applied to quackgrass, preferably in the dry form. This chemical shall be applied evenly once during the season, at the rate of 5 to 6 pounds per square rod in spring months up to July 1, and 4 to 5 pounds after August 1. Retreatments shall be made as necessary, beginning the second spring after the original treatment.

4-8-20.2.5 **Boron Compounds and Mixtures of Borates and Sodium Chlorate.** The application of dry sodium borate materials shall be at the rate of 10 to 11 pounds of boron trioxide (B_2O_3) equivalent per square rod. (This is equal to 16 to 17 pounds of a 65% material.)

Rates of mixtures of soluble borate and sodium chlorate shall be at 8 to 10 pounds per square rod. This would include combinations such as 49% B_2O_3 equivalent and 25% sodium chlorate, or 23.3% B_2O_3 and 30% sodium chlorate. The above rates would apply to either the dry form or applied as a spray.

4-8-20.2.6 **Monuron.** Monuron is approved for treatment of quackgrass at rates of 64 to 96 pounds active ingredient per acre. This is equivalent to ½ to ¾ pound of an 80% formulation per square rod. For application as a wettable powder Monuron shall be mixed with not less than 2 gallons of water for each pound of Monuron.

Dispose of empty chemical containers so they pose no hazard to humans, animals or valuable plants.

4-S-21

PIGNUT OR INDIAN RUSH PEA

(Hoffmannseggia densiflora)

4-S-21.1 CULTIVATION PRACTICES

4-S-21.1.1 Cultivation. Cultivation of pignut infested areas as hereinafter set forth, may begin any time during the growing season, and shall be done in such a manner as to cut off all the weed plants at each operation. Cultivation shall be 3 to 5 inches deep at intervals so as to permit the weeds to grow not more than 10 days after each emergence of first plants, but not to exceed intervals of 3 weeks. Cultivation shall be continued until the weeds have been eradicated or have been suppressed to such extent that remaining plants may be more economically destroyed by other treatment, as the application of approved chemicals to individual plants or by hand cultivation.

4-S-21.1.2 Grubbing. Small infestations should be grubbed out, taking care to remove all the tuberous nutlike roots.

4-S-21.2 APPLICATION OF CHEMICALS

4-S-21.2.1 Trichlorobenzoic acid (TBA). A chemical whose active trichlorobenzoic acid ingredient contains approximately 50% 2,3,6 trichlorobenzoic acid (2,3,6 TBA) in combination with other trichlorobenzoic acid isomers applied at 20 pounds acid equivalent per acre is approved for control of pignut and may be applied in liquid or granular form.

4-S-21.2.2 Polychlorobenzoic acid (PBA). A mixture of primarily dichloro, trichloro, and tetrachloro benzoic acids applied at 40 pounds acid equivalent per acre is approved for control of pignut and may be applied in liquid or granular form.

4-S-21.2.3 Fenac. Applied at 15 to 20 pounds acid equivalent per acre is approved for control of pignut. Application can be made in liquid or granular form.

4-S-21.2.4 2,3,6-Trichlorobenzyloxypropanol. Applied at 16 to 20 pounds acid equivalent per acre is approved for control of pignut. Application can be made in liquid or granular form.

4-S-22

GOATGRASS

(Aegilops cylindrica)

4-S-22.1 CULTIVATION AND CROPPING

4-S-22.1.1 Cultivated Land. Prevent seed production. Avoid planting crop seed which contains goatgrass.

In order to prevent seed production the infested area must not be planted to fall sown small grains. Seed of goatgrass will remain viable in the soil for 3 to 4 years after it is produced. Therefore, to prevent reinfestation the land must be managed for a least 3 years in such a manner as to prevent emerging plants from maturing seed.

4-S-22.1.2 Fence rows, road ditches, and other noncultivated land. Prevent seed production. Mowing at or shortly before heading will prevent seed production.

4-S-22.2 APPLICATION OF CHEMICALS

4-S-22.2.1 Dalapon. Apply 4 to 5 pounds per acre of a material containing 74% 2,2 dichloropropionic acid equivalent in the fall after the goatgrass has emerged or in the spring prior to May 1 in southern Kansas or May 15 in northern Kansas. For treating small patches use ¼ pound of dalapon per 3 gallons of water and apply to point of run-off.

4-S-22.2.2 TCA. Apply 8 to 10 pounds acid equivalent per acre in the fall after the goatgrass has emerged, or prior to May 1 in the spring. For treatment of small patches use one pound TCA per 3 gallons of water and apply to point of run-off.

Never use a stronger concentration of a pesticide than is recommended on the label. (It is *not* true that if a little is desirable, a lot is better.)

4-8-25

MUSK (NODDING) THISTLE

(Carduus nutans L.)

4-8-25.1 CULTIVATION AND CULTURAL

Close mowing twice during the growing season aids in preventing seed production and eventually eliminates the plant. This practice is well suited to pasture areas, roadsides, etc. Whenever possible, large heavily-infested areas should be put into clean cultivation. Two or three years of clean cultivated crops will eliminate the infestation and permit the area to be reseeded. Only crop seed that is free of the weed should be planted.

4-8-25.2 APPLICATION OF CHEMICALS

Good control can be had with 2,4-D. Apply one pound acid equivalent per acre in the spring before flowering stalks lengthen, and a late fall application to rosettes. Repeat treatment is necessary for complete control. In most years the time between April 15 and May 10 is most satisfactory. Treatment delayed until the stem begins to lengthen generally result in unsatisfactory control. Musk thistle has the ability to establish new seedlings during warm periods in late fall. These can be controlled by a repeat application.

4-8-26 APPROVED CHEMICALS

The following chemicals are approved for use as official methods for the control and eradication of noxious weeds when applied in accordance with methods prescribed in these regulations.

a. Sodium chlorate
b. Mixtures of sodium chlorate and borates
c. 2,4-D (2,4-dichlorophenoxy acetic acid)
d. TCA (trichloroacetic acid)
e. Boron compounds
f. Monuron (3-(p-Chlorophenyl)-1,1-dimethylurea
g. Dalapon (2,2 dichloropropionic acid)
h. Erbon (2-(2,4,5-Trichlorophenoxy) ethyl 2,2 Dichloropropionate)
i. Mixture of 94% disodium tetraborate and 4% monuron (3-chlorophenyl)-1-1 dimethylurea)

j. Mixture of 57% sodium metaborate and 40% sodium chlorate and 1% monuron (3-(p-Chlorophenyl)-1,1-dimethylurea)
k. Trichlorobenzoic acid (2,3,6 TBA) (dimethylamine salts)
l. Polychlorobenzoic acid (PBA) (dimethylamine salts)
m. Amitrole (3-amino-1 2,4-triazole)
n. Atrazine (2-chloro-4-ethylamino-6-isopropylamino-s-triazine)
o. Fenac (2,3,6-trichlorophenylacetic acid)
p. 2,3,6-Trichlorobenzyloxypropanol

4-8-27 SERVICE OF NOTICES AND STATEMENTS

Notices and statements required by Section 2-1320, G. S. 1945 Supp., shall be deemed sufficient, when given (a) by serving upon the landowner or his agent or trustee or upon an executor or administrator of the estate of a deceased landowner or upon a guardian of the estate of a minor who owns land or upon a guardian of the estate of an insane person who owns land or upon the supervisor of land, by personal delivery to any of said persons in the county or city where the land is situated, or (b) by leaving a copy of said notice or statement at the usual place of residence of said landowner or his authorized representative in said county or city, or (c) by delivering a copy of said notice or statement upon premises wholly or partially infested with noxious weeds, or upon premises which have not been properly or sufficiently treated or worked for eradication of noxious weeds, to some person over the age of 12 years residing thereon, or (d) if premises are found to be unoccupied, by posting a copy of said notice in a conspicuous place upon said premises, or (e) in lieu of any of above methods by sending a copy of said notice or statement to the landowner or his authorized representative by registered mail to his last known address. Notice to one of several joint owners or tenants in common shall be deemed sufficient notice to all.

Service of such notices and statements in the manner above provided shall be deemed sufficient when served by a county, district or city weed supervisor, a county commissioner, a sheriff, a member of the governing body of any city, a marshal, a policeman or a constable, within the respective jurisdiction of each.

If symptoms of illness occur during or shortly after handling chemicals, call a physician or get the patient to the hospital immediately.

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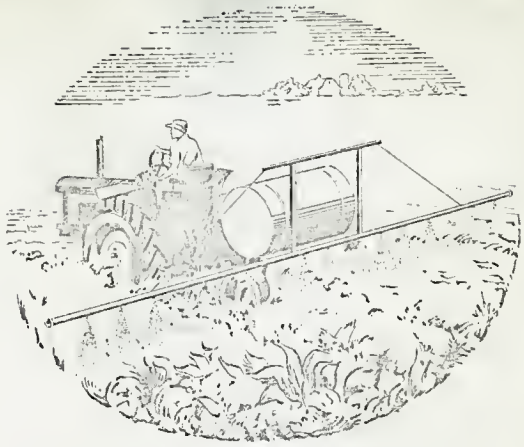


CALIBRATION OF SPRAYERS

The applicator of chemical must calibrate his sprayer so that he can apply the chemical accurately. It is important to know the amount their sprayers are applying. Failure to calibrate accurately may prevent satisfactory weed control if the application is too light, or increase the danger of crop injury if more chemical than necessary is applied.

Sprayers may be calibrated in several ways. One method is as follows:

1. Check all nozzles with individual containers to make sure their output is equal. Replace bad nozzles.
2. Fill the sprayer tank full of water.
3. Have pressure adjusted as you will use it in the field (usually 35 to 40 pounds).
4. Drive exactly ¼ of a mile, or 40 rods, at the speed you will use when spraying (4 or 5 miles per hour constant speed).
5. Refill the tank measuring the amount of water required (to the nearest ¼ gallon).
6. Calculate the rate of application as follows:
   (a) *Multiply the number of gallons used times 66*
   (b) *Divide this answer by the boom coverage in feet*
   (c) *The answer equals number of gallons per acre*
7. Example: If 2½ gallons were used in ¼ mile and the width covered by the boom is 16½ feet, to calculate, multiply 2½ x 66 and divide by 16½. The result is 10 gallons per acre.

$$\frac{2.5 \times 66}{16.5} = 10 \text{ gallons per acre}$$

THE KANSAS SEED LAW

AS AMENDED BY THE LEGISLATURE OF 1961

EFFECTIVE JULY 1, 1961

Section 2-1415. DEFINITIONS. As used in this act: (1) The term "agricultural seed" means the seed of grass, legume, forage, cereal and fiber crops, or mixtures thereof, but shall not include horticultural seeds.

(2) The term "person" means and includes individuals, members of a partnership, a corporation, the executive and managing officers of corporations and associations, and agents and brokers.

(3) The term "processed" means cleaned, or cleaned and blended, to meet the requirements of agricultural seed for the purpose of being planted or seeded.

(4) The term "kind" means one or more related species or subspecies which singly or collectively is known by one common name, and includes, among others, wheat, oat, vetch, sweet clover, and alfalfa.

(5) The term "variety" means a subdivision of a kind, which is characterized by growth, yield, plant, fruit, seed or other characteristics by which it can be differentiated from other plants of the same kind.

(6) The term "hard seed" means the seeds, which because of hardness or impermeability do not absorb moisture or germinate under seed testing procedure.

(7) The term "label" means the statements written, printed, stenciled or otherwise displayed upon, or attached to, the container of agricultural seed, and includes other written, printed, stenciled or graphic representations, in any form whatsoever, pertaining to any agricultural seed, whether in bulk or in containers, and includes declarations and affidavits.

(8) The term "secretary" means the secretary of the Kansas state board of agriculture.

(9) The term "weed seeds" means seeds of plants considered weeds in this state and shall include noxious weed seeds, determined by methods established by regulation under this act.

(10) Noxious weed seeds are divided into two classes: (*a*) "prohibited noxious weed seed," (*b*) "restricted noxious weed seed" as defined in this subsection:

(*a*) "Prohibited noxious weed seed" means the seed of field bindweed (*Convolvulus arvensis*), Russian knapweed (*Centaurea repens*), hoary cress (*Lepidium draba*), Canada thistle (*Cirsium arvense*), leafy spurge (*Euphorbia esula*), quackgrass (*Agropyron repens*), bur ragweed (*Franseria tomentosa*), pignut (Indian rushpea) (*Hofmannseggia densiflora*), Texas blueweed (*Helianthus ciliaris*), Johnson grass (*Sorghum halepense*), sorghum almum, and any plant the seed of which cannot be distinguished from Johnson grass.

(*b*) "Restricted noxious weed seed" means and includes weed seeds or bubblets which shall not be present in agricultural seed at a rate per pound in excess of the number shown following the name of each weed seed, to wit: Wild mustards (*Brassica* spp.) 45, buckhorn plantain (*Plantago lanceolata*)

45, wild onion or garlic (*Allium* spp.) 45, dodder (*Cuscuta* spp.) 45, wild carrot (*Daucus carota*) 45, morning glory (*Ipomoea* spp.) 45, hedge bindweed (*Convolvulus sepium*) 45, pennycress (*Thlaspi arvense*) 45, swamp smartweed (*Polygonum coccineum*) 45, dock (*Rumex* spp.) 90, ox-eye daisy (*Chrysanthemum leucanthemum*) 90, perennial sowthistle (*Sonchus arvensis*) 90, musk (nodding) thistle (*Carduus nutans L.*) 90, silverleaf (Purple) nightshade (*Solanum elaeagnifolium*) 90, giant foxtail (*Setaria faberi*) 90, horsenettle (Bullnettle) (*Solanum carolinense*) 180, chess or cheat (*Bromus secalinus*) 90: *Provided*, That the total of restricted noxious weed seeds shall not exceed 300 per pound: *And provided further*, That in native grass, smooth brome grass, fescues and orchard grass seeds, chess or cheat shall not exceed 5,000 per pound.

(11) The term "advertisement" means all representations, other than those on the label, disseminated in any manner, or by any means, relating to agricultural seed.

(12) The term "record" means and includes all information relating to any shipment of agricultural seed, and includes a file sample of each lot of such seed.

(13) The term "stop sale order" means an administrative order, authorized by law, restraining the sale, use, disposition, and movement of a definite amount of agricultural seed.

(14) The term "seizure" means a legal process, issued by court order, against a definite amount of seed.

(15) The term "lot" means a definite quantity of agricultural seed, identified by a lot number or other mark, every portion or bag of which is uniform, within recognized tolerances for the factors which appear in the labeling, which is the processor's identification.

(16) The term "germination" means the percentage of seeds capable of producing normal seedlings under ordinarily favorable conditions, in accordance with the methods established by regulation under this act.

(17) The term "pure seed" means the kind of seed declared on the label, exclusive of inert matter, other agricultural or other crop seeds, and weed seeds.

(18) The term "inert matter" means all matter not seeds, and as otherwise determined by regulations under this act.

(19) The term "other agricultural seeds or other crop seeds" means seeds of agricultural seeds other than those included in the percentage or percentages of kind or variety, and shall include collectively all kinds and varieties not named on the label.

(20) The term "type" means a group of varieties so nearly similar that the individual varieties cannot be clearly differentiated except under special conditions.

(21) The term "treated" means that the seed has received an application of a substance or process which substance or process is designed to reduce, control or repel certain disease organisms, insects or other pests attacking such seeds or seedlings growing therefrom. The term "treated" further implies an application of a substance or process designed to increase seedling vigor.

(22) The term "tested seed" means that a representative sample of the lot of agricultural seed in question has been subjected to examination and its character as to purity and germination determined.

(23) The term "native grass seed" means the seeds of aboriginal or native prairie grasses.

Sec. 2-1416. TESTING REQUIRED. It shall be unlawful for any person to offer or expose for sale, sell or exchange any agricultural seed for planting or seeding purposes that has not been tested and is not labeled. This provision shall apply to grain when sold as such or when sold according to grain standards and the seller knows, or has reason to know, it is to be used for seed.

Sec. 2-1417. LABEL REQUIRED. Each and every bulk quantity, package, or parcel of agricultural seed, offered for sale, or exposed for sale, or exchanged for planting or seeding purposes, shall have a label, affixed thereto or printed or stenciled thereon, in the English language, giving the following information, which shall not be modified or denied in the labeling, or on another label attached to the container, and in bulk quantity shall be furnished with the invoice:

(*a*) The commonly accepted name of the kind or the name of the kind and the variety, of each agricultural seed component in excess of five percent (5%) of the whole, and the percentage by weight of each in the order of its predominance. Where more than one component is required to be named, the word "mixture" or the word "mixed" shall be shown conspicuously on the label.

(*b*) The percentage by weight of pure seed.

(*c*) The percentage by weight of all weed seeds.

(*d*) The percentage by weight of inert matter.

(*e*) For each named agricultural seed:

(1) The percentage of germination, exclusive of hard seed.

(2) The percentage of hard seeds, if present.

(3) Total germination percentage including hard seed may be shown.

(4) The calendar month and year the test was completed to determine such percentages.

(*f*) The percentage by weight of agricultural seeds (which may be designated as "crop seeds") other than those required to be named on the label.

(*g*) The lot number or other lot identification.

(*h*) The origin: *i. e.*, the state or foreign country where grown, except grass seeds in quantities of less than ten (10) pounds for lawn seeding purposes, or a declaration that origin of seed is unknown to seller.

(*i*) The name and rate of occurrence per pound of each kind of "restricted noxious weed seeds" present, which shall not be more than the number per pound of restricted noxious weed seed in agricultural seed, as provided in section 1 (10) (*b*) of this act.

(*j*) The name and address of person responsible for such statement.

(*k*) Agricultural seed which has been treated with chemicals for insect or disease control, shall be labeled to show the following:

(1) A word or statement indicating that the seed has been treated.

(2) The commonly accepted, coined, chemical or abbreviated chemical (generic) name of the applied substance.

(3) If the substance in the amount applied is harmful to human or other vertebrate animals, a caution statement, such as: "Do not use for food, feed or oil purposes." The caution for mercurials and similarly toxic substances must include in a contrasting color the word poison and skull and crossbones.

(4) A separate label may be used to show this information, or it may be a component part of the main label.

Sec. 2-1421. PROHIBITIONS. (A) It shall be unlawful for any person to sell, offer for sale, or expose for sale, any agricultural seed for seeding purposes:

(1) Unless a test has been made to determine the percentage of germination and it shall have been completed within a 9-month period (exclusive of the calendar month in which the test was completed) immediately prior to sale, exposure for sale, or offering for sale;

(2) Which is not labeled in accordance with the provisions of this act;

(3) Which has a false, misleading, or incomplete label;

(4) Which contains prohibited noxious weed seeds;

(5) Which contains restricted noxious weed seeds in excess of the quantity prescribed by section I (10) (*b*) of this act;

(6) (*a*) Other than native grass seed, which contains more than two percent (2%) of weed seeds by weight;

(*b*) Native grass seed which contains more than 4 percent (4%) of weed seeds by weight.

(7) If any label, advertisement, or other media represents such agricultural seed to be certified or registered, unless:

(*a*) Such certification or registration has been determined by an official seed certifying agency approved by the secretary; and

(*b*) Such seed bears an official label issued for such seed, by such agency stating that the seed is certified or registered.

(B) It is unlawful for any person:

(1) To alter or deface any label so that the information is false or misleading, or to mutilate any label;

(2) To disseminate any false or misleading advertisements concerning agricultural seed;

(3) To issue any statement, invoice, or declaration as to the variety of any agricultural seed which is false or misleading;

(4) To hinder or obstruct the secretary, or his authorized representative, in the performance of his duties;

(5) To fail to comply with a "stop sale order," or to move or otherwise handle or dispose of any quantity of seed held under a "stop sale order," or a "stop sale" tag attached thereto, except with express permission of the enforcing officer in writing, and except for the purpose specified therein;

(6) To use the word "trace" as a substitute for any statement which is required;

(7) To use the word "type" in any labeling in connection with the name of any agricultural seed variety: *Provided*, It shall not be a violation of this act for the grower of agricultural seed to sell on his premises for planting or seeding purposes, corn, sorghum, kafir, wheat, rye, barley or oats which is not tested and labeled when the seed is grown on his land and is free from noxious weed seed.

Sec. 2-1422. Any person who shall violate any of the provisions of this act shall be deemed guilty of a misdemeanor and upon conviction thereof shall be punished by a fine of not less than twenty-five dollars ($25) nor more than five hundred dollars ($500).

Sec. 2-1422a. Agricultural seed which is mislabeled shall be considered a common nuisance and subject to seizure and injunction in the manner as provided by law. In the event the court finds the seed to be in violation of this act, and orders the condemnation of said seed, it may be denatured, reprocessed, destroyed, relabeled, or otherwise disposed of as the court may direct: *Provided*, That in no instance shall the court order a disposition of said seed without first having given the defendant an opportunity to be heard and to apply to the court (*a*) for permission to reprocess or relabel it to bring it into compliance with law and any rules or regulations applicable thereto, and (*b*) for a release of said seed. When, in the performance of his duties, the secretary or his duly authorized representative, applies to any court for a temporary restraining order or a temporary or permanent injunction, restraining any person from violating or continuing to violate any of the provisions of this act, or any rule and regulation under this act, said order shall be issued without bond, and said order shall be issued without regard to whether any criminal proceeding has been instituted.

Sec. 2-1423. (A) INSPECTION. The secretary or his duly authorized representative shall inspect, sample and determine the purity and germination of agricultural seed at such time and in such places, and to such extent as the secretary or his representative may deem advisable. The secretary or his authorized representative may stop further sale or movement of any lot or lots of agricultural seed when found to be in violation of any of the provisions of this act, until compliance with the law has been satisfied or other disposition made. The duty of enforcing this act and carrying out its provisions and requirements is vested in the secretary or his duly authorized representative. It is the duty of such officers:

(1) To sample, inspect, make analysis of, and test agricultural seeds transported, sold or offered for sale or exposed for sale, within the state for planting and seeding purposes, at such time and place and to such extent as may be deemed necessary to determine whether said agricultural seeds are in compliance with provisions of this act;

(2) To co-operate with the United States department of agriculture and other agencies in seed law enforcement.

(B) ACCESS. The secretary or his authorized representatives shall have free access during reasonable hours to all places of business, buildings, vehicles, cars, and vessels, of whatsoever kind, used in the sale, transportation, importation, or storage of agricultural seed, and shall have the power and authority:

(1) To inspect the records concerning the place of origin, or concerning the sale, of any agricultural seed;

(2) to open any package containing or suspected of containing any agricultural seed that is exposed or offered for sale; and

(3) to take therefrom samples of contents for examination. The owner of the seed shall be paid the retail price of the sample so procured if he so requests.

(C) STOP SALE ORDERS. The secretary or his authorized representatives shall have the authority:

(1) To issue and enforce a written or printed "stop sale" order to the owner or custodian of any quantity of agricultural seed which the secretary or his duly authorized representatives determines to be in violation of any of the provisions of this act or rules and regulations promulgated thereunder, which order shall prohibit further sale, processing and movement of such seed, except on approval of enforcing officer, until such officer has evidence that the law has been complied with, and he has issued a release from the "stop sale" order of such seed: *Provided*, In respect to seed which has been denied sale, processing and movement as provided in this paragraph, the owner or custodian of such seed shall have the right to appeal from said order to a court of competent jurisdiction in the locality in which the seeds are found, praying for a release from such order and for the discharge of such seed from the order prohibiting the sale, processing and movement in accordance with the findings of the court: *And provided further*, The provisions of this paragraph shall not be construed as limiting the right of the enforcement officer to proceed as authorized by other sections of this act.

Sec. 2-1424. REPORT OF VIOLATIONS. When the said secretary decides that prosecution for violation of this act is warranted, he shall report the facts to the prosecuting attorney of the county in which the violation was committed and furnish that officer with a copy of the results of the analysis or other examination of such agricultural seed duly attested to by the analyst or other representative making the examination.

Sec. 2-1424a. LABORATORY. The state board of agriculture shall establish and maintain a seed laboratory, and employ such qualified analysts, helpers, and agents, as it may deem to be necessary to carry out the provisions of chapter 2, article 14, of the General Statutes of 1949, and acts amendatory thereof or supplemental thereto.

Sec. 2-1425. SEED TESTING. Any person a resident of Kansas may submit to the state seed laboratory, without charge, not to exceed five (5) samples of agricultural seed, which shall not include more than one sample of native grass seed, each fiscal year for germination or purity tests, or both, or other examinations in accordance with such rules and regulations as may be prescribed by the state board of agriculture. Any non-resident person, and any resident person desiring more than five (5) samples tested during any fiscal year, may submit to the state seed laboratory samples of agricultural seed for germination or purity tests, or both, or other examination and receive the test upon paying to the secretary a fee per sample, test or examination as the state board of agriculture may decide. The state board of agriculture is hereby authorized and directed to establish by regulation, a schedule of fees for seed testing and examination, to be used as the basis of charges: *Provided*, That such fees shall not be less than one dollar ($1) or more than twenty dollars ($20) per test or examination. The secretary may extend credit for work done, and the sender of the sample may be invoiced for such charges from time to time. Testing shall be discontinued for any person who fails to pay such charges within thirty (30) days after invoice is issued. Such fee shall be deposited by the said secretary with the state treasurer in a fund to be known as the "seed fee fund" and used for the purpose of carrying out the

provisions of article 14 of chapter 2 of the General Statutes of 1949, and all acts amendatory thereof and supplemental thereto: *Provided*, That the limitation on free tests shall not apply to the state boards, commissions, or educational, penal or eleemosynary institutions. The state seed laboratory shall not be obligated to analyze any uncleaned, unprocessed, and other time-consuming sample, or any sample which obviously does not meet state seed law requirements.

Sec. 2-1426. REPORTS. The secretary shall, at his discretion, issue or publish reports setting forth results of inspections, examinations, analyses, or tests conducted under the provision of chapter 2, article 14, of the General Statutes of 1949, and acts amendatory thereof and supplemental thereto, which report may include the names of persons, associations of persons, or corporations having had agricultural seed under examination, and he may issue other reports giving information on agricultural seed.

Sec. 2-1426a. RECORDS. Each person whose name appears on the label as handling agricultural seeds subject to this act, shall keep for a period of three (3) years complete records of each lot of agricultural seed handled, and shall keep a file sample of each lot of seed for a period of one (1) year after final disposition of said lot of agricultural seed. All such records and samples pertaining to any shipment of agricultural seed shall be accessible during customary business hours, for inspection by the secretary, or his duly authorized representative.

Sec. 2-1427. RULES AND REGULATIONS. The state board of agriculture is hereby empowered to make and publish such rules and regulations after public hearing as it may deem necessary to carry into effect the full intent and meaning of chapter 2, article 14, of the General Statutes of 1949, and acts amendatory thereof and supplemental thereto, and the secretary is hereby empowered to enforce the provisions of this act and the rules and regulations promulgated by the state board of agriculture.

Sec. 2-1428. APPROPRIATION. For the purpose of carrying out the provisions of this act there shall be appropriated to the state board of agriculture, out of any funds in the state treasury not otherwise appropriated, such sum as the legislature may decide. The state controller is hereby authorized to draw warrants on the state treasurer against such funds for the purposes herein provided, upon the presentation of vouchers approved by the secretary.

KANSAS CHEMICAL SPRAY LAW (1963)

(Art. 9, Ch. 3, 1953 Supplement, as Amended by Laws of 1955)

3-901 - As used in this act, unless the context clearly requires otherwise, the following words and phrases shall have the meanings ascribed to them in this section:

(1) "Herbicide" means any substance or mixture of substances, labeled, designed, or intended for use in preventing, destroying, repelling, or mitigating any weed;
(2) "insecticide" means any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any insects;
(3) "fungicide" means any substance or mixture of substances intended for preventing, destroying, repelling or mitigating fungi;
(4) "weed" means any plant which grows where not wanted;
(5) "person" means any individual, firm, partnership, association, corporation, or organized groups of persons whether incorporated or not;
(6) "secretary" means the secretary of the state board of agriculture;
(7) "registrant" means any owner or operator of aircraft who is registered with the secretary, and has paid the annual fee;
(8) "aircraft" means heavier than air, propellor driven airplane and helicopters of any type, which have been equipped with apparatus designed for, or susceptible for, use to disperse liquid sprays, dusts, aerosols, or fogs from the air;
(9) "owner" means any person owning aircraft and aerial dispersing equipment;
(10) "operator" means any person who acts as agent or manager for the owner or directs the actual operation of aircraft and aerial dispersing equipment;
(11) "non-resident" means any owner or operator who is not a resident of this state;
(12) "aerial dispersing equipment" means equipment used to disperse fungicides, herbicides and insecticides from aircraft.

3-902 - An owner or operator of aerial dispersing equipment, as defined in this act, shall not use or apply any insecticide, herbicide or fungicide on agricultural land in this state unless such owner or operator has first registered with the secretary as required by section 3-903 of the General Statutes Supplement of 1953 and paid the annual fee. The secretary is authorized to receive all applications for registrations of such owners and operators in accordance with provisions of article 9 of chapter 3 of the General Statutes Supplement of 1953,

and acts amendatory and supplemental thereto, and shall promptly process such applications and issue certificates of registration thereon, where he determines that all requirements of the act pertaining to registration have been satisfied.

3-903 - Any owner or operator who uses or applies insecticides, herbicides, or fungicides shall, at the time he makes application for registration, give his name, permanent address, type and aircraft identification number issued by the civil aeronautics administration of aircraft and type of aerial dispersing equipment for which he is registering. Each registrant shall pay an annual registration fee of ten dollars ($10) for each aircraft registered. Said fees shall accompany the application for registration which shall be submitted on a form supplied by the secretary. All registrations shall expire on December 31.

3-906 - Nonresident applicants must furnish evidence of qualifications to engage in application of herbicides, insecticides or fungicides in their native state, if any, and shall make payment of registration fees charged by their native state or by this act, whichever is greater. Nonresident applicants shall also post bonds required by their native state or by this state, whichever is the greater.

3-907 - Every registrant shall make records of his activities, which shall include on each spraying or dusting job:

(1) The name of the registrant;
(2) the name of the landowner, or customer;
(3) the legal description of the area treated;
(4) the date of application of spray or dust;
(5) the kind of insecticide, herbicide, or fungicide used;
(6) the quantity used;

A copy of such report shall, in every case, be kept in applicator's file for a period of three (3) years from date of application. Any such report shall be made available to the secretary upon request at any time. A duplicate report shall be furnished to the customer immediately following application. The secretary is authorized to prescribe such forms as he deems necessary to carry out the provisions of this act.

3-908 - Registration with the secretary, and making the reports required by this act, shall not exonerate the owner or operator from responsibility for damages resulting from overdosing, drifting, volatilization or misapplication of herbicides, insecticides or fungicides.

3-909 - All moneys collected by the secretary under the provisions of this act shall be paid into the state treasury at

least once monthly, and shall be by the state treasurer placed in a separate fund, to be designated as the "aerial spraying fund," which fund is hereby created. Said fund shall be used by the secretary for the administration of this act.

3-910 - Any owner or operator of aerial equipment used for dispersing herbicides, insecticides and fungicides who shall operate in this state without registering or without making reports as required by article 9 of chapter 3 of the General Statutes Supplement of 1953, and acts amendatory and supplemental thereto, shall be deemed guilty of a misdemeanor, and shall upon conviction be punished by a fine of not less than one hundred dollars ($100) and not more than five hundred dollars($500). Each day of operation by an aerial spray operator without first having been registered with the secretary, shall constitute a separate offense.

3-903a - Any person arrested for failure to register as required in this act and who desires to continue operation as an aerial spray operator shall, at the time of filing an appearance bond in any criminal action brought against him, and in addition to such appearance bond, furnish to the court, or the clerk thereof, a corporate surety bond conditioned that he will in the event of conviction or subsequent plea of guilty pay into the hands of the court the sum of five hundred dollars ($500) for each day, or fraction thereof, of operation from the date of such arrest without having complied with the registration provisions of this act; Provided, that any money so received by the court from the defendant, or the surety upon his bond, shall be construed and distributed as a fine.

3-904 - Every owner or operator of aircraft shall furnish an acceptable bond before his registration shall be approved. Said owner or operator shall deliver to the secretary a bond executed by the applicant as principal, and by a solvent corporate surety authorized to do business in Kansas, as surety, in the sum of two thousand dollars ($2,000) for the first aircraft, and in the additional sum of one thousand dollars ($1,000) for each additional aircraft that applicant presents for registration. Said bond shall be for a term of not to exceed one (1) year, and shall extend to cover the registration period; shall be to the state of Kansas, and shall be conditioned upon compliance by the principal, his agents, servants, employees and licensees with the provisions of article 9 of chapter 3 of the General Statutes Supplement of 1953, and acts amendatory and supplemental thereto, and for the use and benefit of such persons as may suffer injury or damages as the result of applicant's negligent dispersal of fungicides, herbicides or insecticides: Provided, however, That the aggregate liability of the surety to all such persons shall, in no event, exceed the sum of said bond.

3-905 - As a condition precedent to the registration of any non-resident owner or operator, the secretary shall require the written consent, irrevocable, of said owner or operator, that action for damages resulting from the application or misapplication of herbicides, insecticides and fungicides and actions to enforce contracts and for the breach of contracts providing for application of herbicides, insecticides and fungicides, may be commenced against said nonresident in the proper court of any county in this state in which a cause of action may arise or in which the plaintiff resides by the service of process on the secretary of the state of Kansas, and stipulating and agreeing that such service shall be taken and held in all courts to be as valid and binding as if personal service had been made within this state upon said nonresident owner or operator. The summons shall be directed to the secretary of the state and shall require the defendant to answer by a certain day not less than forty (40) days after date. Such summons and a certified copy of the petition shall be forwarded by the clerk of the court to the secretary of the state, who shall forward a copy of the summons and the certified copy of the petition to the nonresident registrant sued, and thereupon the secretary of the state shall make return of summons to the court, showing the date of its receipt, the date of forwarding the copies, and the name and address of the nonresident to whom forwarded. Such return shall be under the hand and seal of the secretary of state and shall have the same effect as return made by the sheriff on process directed to him.

Kansas Agricultural Chemical (Economic Poison) Act

AS AMENDED BY THE LEGISLATURE OF 1963

SECTION 1. *Title.* This act may be cited as the "agricultural chemical act of 1947."

SEC. 2. *Definitions.* For the purpose of this act:

(*a*) The terms "agricultural chemical" and "economic poison" shall he construed as synonymous terms, and shall mean and include any substance or mixture of substances labeled, designed or intended for use in preventing, destroying, repelling, or mitigating any insects, rodents, predatory animals, fungi, weeds, nematodes and other forms of plant or animal life or viruses, which the secretary shall declare to be a pest, and any substance labeled, designed or intended for use as a defoliant, and any substance or mixture of substances, labeled, designed or intended for use as a plant regulator, or desiccant. Viruses on or in living man or other animals are specifically excepted and excluded from this definition. Drugs recognized by the United States pharmacopeia or the national formulary, the label of which bears the descriptive abbreviations for these compendia, U. S. P. or N. F. as the case may be, are specifically excepted, and excluded from this definition.

(*b*) The term "insecticide" means and includes any substance or mixture of substances, labeled, designed or intended for use in preventing, destroying, repelling, or mitigating any insects which may be present in any environment whatsoever.

(*c*) The term "fungicide" means and includes any substance or mixture of substances, labeled, designed, or intended for use in preventing, destroying, repelling, or mitigating any fungi.

(*d*) The term "rodenticide" means and includes any substance or mixture of substances, labeled, designed, or intended for use in preventing, destroying, repelling, or mitigating rodents or any other vertebrate animals which the secretary shall declare to be a pest.

(*e*) The term "herbicide" means and includes any substance or mixture of substances, labeled, designed, or intended for use in preventing, destroying, repelling, or mitigating any weed.

(*f*) The term "nematocide" means any substance or mixture of substances, labeled, designed, or intended for use in preventing, destroying, repelling, or mitigating any nematodes.

(*g*) The term "defoliant" means and includes any substance or mixture of substances, labeled, designed, or intended for use for defoliating plants, preparatory to harvest for purpose of obtaining early or controlled maturity.

(*h*) The term "plant regulator" means any substance or mixture of substances, labeled, designed, or intended through physiological action, for accelerating or retarding the rate of growth or rate of maturation, or for otherwise altering the behavior of ornamental or crop plants or the produce thereof, but shall not include substances to the extent that they are intended as plant nutrients, trace elements, nutritional chemicals, plant inoculants, and soil amendments.

(*i*) The term "desiccant" means any substance or mixture of substances labeled, designed, or intended for artificially accelerating the drying of plant tissues.

(*j*) The term "insect" means a small invertebrate animal generally having the body more or less obviously segmented, for the most part belonging to the class insecta, comprising six-legged, usually winged forms, as for example, beetles, bugs, bees, flies, and to other allied classes of arthropods whose members are wingless and usually have more than six legs, as for example, spiders, mites, ticks, centipedes, and wood lice.

(*k*) The term "fungi" means and includes any nonchlorophyll-bearing thallophytes (any nonchlorophyll-bearing plants of a lower order than mosses and liverworts) and includes rusts, smuts, mildews, molds, yeasts, and bacteria, except those on or in living man or other animals.

(*l*) The term "weed" means and includes any plant which grows where not wanted.

(*m*) The term "nematode" means invertebrate animals of the phylum nemathelminthes and class Nemotoda, that is, unsegmented round worms with elongated, fusiform, or sacklike bodies covered with cuticle, and inhabiting soil, water, plants or plant parts; may also be called nemas or eelworms.

(*n*) The term "fumigant" means any substance or mixture of substances which emits or liberates a gas or gases, which are used in controlling, destroying, or mitigating insects or rodents and which are usually dangerous to man and other animals.

(*o*) The term "ingredient statement" means a statement of the name and percentage of each active ingredient, together with the total percentage of the inert ingredients, in the agricultural chemical; if the agricultural chemical contains arsenic in any form, the statement shall include the percentages of total and water soluble arsenic, each calculated as elemental arsenic: *Providing*, That if the agricultural chemical is not highly toxic to man, and if the agricultural chemical does not contain arsenic in any form, and if the agricultural chemical is not a fumigant, and if a statement of the total percentage of each active ingredient is filed with the secretary, then the term "ingredient statement" shall be construed to mean a statement of the name of each active ingredient listed in the order of greatest percentage of each present in the product, togther with the name and total percentage of the inert ingredients, if any there be in the agricultural chemical.

(*p*) The term "active ingredient" means

(1) in the case of any agricultural chemical other than a plant regulator, defoliant, or desiccant, an ingredient which will prevent, destroy, repel, or mitigate insects, nematodes, fungi, rodents, weeds or other pests;

(2) in the case of a plant regulator an ingredient which, through physiological action, will accelerate or retard the rate of growth or rate of maturation or otherwise alter the behavior of ornamental or crop plants or the produce thereof;

(3) in the case of a defoliant, an ingredient which will cause the leaves or foliage to drop from a plant;

(4) in the case of a desiccant, an ingredient which will artificially accelerate the drying of plant tissue.

(*q*) The term "inert ingredient" means an ingredient which is not an active ingredient.

(*r*) The term "antidote" means the most practical immediate treatment in case of poisoning and includes first aid treatment.

(*s*) The term "person" means any individual, partnership, association, corporation, or organized group of persons whether incorporated or not.

(*t*) The term "secretary" means the secretary of the Kansas state board of agriculture.

(*u*) The term "registrant" means the person registering any agricultural chemical pursuant to the provisions of this act.

(*v*) The term "label" means the written, printed, or graphic matter on, or attached to, the agricultural chemical or the immediate container thereof, and the outside container or wrapper of the retail package, if any there be.

(*w*) The term "labeling" means all labels and other written, printed or graphic matter:

(1) Upon the agricultural chemical or any of its containers or wrappers;

(2) accompanying the agricultural chemical at any time;

(3) to which reference is made on the label or in literature accompanying the agricultural chemical, except when accurate, non-misleading reference is made to current official publications of the United States department of agriculture or interior, the United States public health services, state experiment stations, state agricultural colleges, or other similar federal institutions or official agencies of this state or other states authorized by law to conduct research in the field of agricultural chemicals.

(*x*) The term "adulterated" shall apply to any agricultural chemical:

(1) The strength or purity of which falls below the professed standard or quality as expressed on labeling or under which it is sold;

(2) if any substance has been substituted wholly or in part for the article;

(3) if any valuable constituent of the article has been wholly or in part abstracted.

(*y*) The term "misbranded" shall apply:

(1) To any agricultural chemical if its labeling bears any statement, design, or graphic representation relative thereto, or to its ingredients, which is false or misleading in any particular;

(2) to any agricultural chemical:

(*a*) Which is an imitation of or is offered for sale under the name of another agricultural chemical;

(*b*) the labeling of which bears any reference to registration under this act;

(*c*) the labeling accompanying which does not contain instructions for use which are necessary for effective results; and which, if complied with, are adequate for the protection of the public;

(*d*) if the label of which does not contain a warning or caution statement which, if complied with, is adequate to prevent injury to living man and other vertebrate animals;

(*e*) the label of which does not bear an ingredient statement on the immediate container;

(*f*) the label of which does not bear an ingredient statement on the outside container or wrapper, if there be one, through

which the ingredient statement on the immediate container cannot be clearly read;

(*g*) upon which there appears any word, statement, or other information required by or under the authority of this act to appear on the labeling, which is not prominently placed thereon with such conspicuousness (as compared with other words, statements, designs, or graphic matter in the labeling) and in such terms as to render it likely to be read and understood by the ordinary individual under customary conditions of purchase and use.

(3) To any insecticide, fungicide, nematocide, or herbicide which when used as directed, or when used in accordance with commonly recognized practices:

(*a*) Shall be injurious to living man or other vertebrate animals, to which it is applied, or to the person applying such agricultural chemical;

(*b*) shall be injurious to vegetation, other than weeds, to which it is applied, or to the person applying such agricultural chemical: *Provided*, That physical or physiological effects on plants or parts thereof shall not be deemed to be injury, when this is the purpose for which the plant regulator, defoliant, or desiccant was applied, in accordance with the label claims and recommendations.

SEC. 3. *Prohibited acts.* (*a*) It shall be unlawful for any person to distribute, sell, or offer for sale within this state or deliver for transportation or transport in intrastate commerce or between points within this state through any point outside this state any of the following:

(1) Any agricultural chemical which has not been registered pursuant to the provisions of section 4 of this act;

(2) any agricultural chemical, if any of the claims made for it, or if any of the directions for its use, differ in substance from the representations made in connection with its registration;

(3) any agricultural chemical if the composition thereof differs from its composition as represented in connection with its registration, unless within the discretion of the secretary, or his authorized representative, a change in the labeling or formula of an agricultural chemical within a registration period, has been authorized, without requiring a registration of the product.

(4) Any agricultural chemical, unless it is in the registrant's or the manufacturer's unbroken immediate container, and there is affixed to such container, and to the outside container or wrapper of the retail package, if there be one through which the required information on the immediate container cannot be clearly read, a label bearing the following:

(*a*) The name and address of the manufacturer, registrant, or person for whom manufactured;

(*b*) the name, brand, or trade mark of said article; and

(*c*) the minimum net weight or measure of the contents: *Provided*, That herbicides shall be labeled to state the net weight of contents.

(5) Any agricultural chemical which contains any substance or substances in quantities highly toxic to man, determined as provided in section 5 of this act, unless the label shall bear, in addition to any other matter required by this act:

(*a*) The skull and crossbones;

(*b*) the word "poison" prominently, in red, on a background of distinctly contrasting color; and

(*c*) a statement of an antidote for the economic poison.

(6) Any standard lead arsenate, basic lead arsenate, calcium arsenate, magnesium arsenate, zinc arsenate, zinc arsenite, sodium fluoride, sodium fluosilicate and barium fluosilicate unless such agricultural chemicals have been distinctly colored or discolored as provided by regulations issued in accordance with this act, or any other white powder agricultural chemical which the secretary, or his authorized representatives, after investigation of and after public hearing on the necessity for such action for the protection of the public health and the feasibility of such coloration or discoloration, shall, by regulation, require to be distinctly colored or discolored; unless it has been so colored or discolored: *Provided*, That the secretary, or his authorized representative, may exempt any agricultural chemical to the extent that it is intended for a particular use or uses from the coloring or discoloring required or authorized by this section if he determines that such coloring or discoloring for such use or uses is not necessary for the protection of the public health or safety.

(7) Any agricultural chemical which is adulterated or misbranded.

(*b*) It shall be unlawful:

(1) For any person to detach, alter, deface, or destroy, in whole or in part, any label or labeling provided for in this act, or by regulations promulgated hereunder, or to add any substance to, or take any substance from, an agricultural chemical in any manner which may defeat the purposes of this act.

(2) For any person to use for his own advantage or to reveal, other than to the secretary or his authorized representative, or proper officials or employees of the state or to the courts of this state in response to a subpoena, or to physicians, or in emergencies to pharmacists and other qualified persons, for use in the preparation of antidotes, any information relative to formulas of products acquired by authority of section 4 of this act.

SEC. 4. *Registration.* (*a*) Every agricultural chemical which is distributed, sold, or offered for sale within this state or delivered for transportation or transported in intrastate commerce or between points within this state through any point outside this state shall be registered in the office of the secretary. All registration of products shall expire on the thirty-first day of December, following date of issuance, unless such registration shall be renewed annually, in which event expiration date shall be extended for each year of renewal registration, or until otherwise terminated: *Provided*, That

(1) products which have the same formula, and are manufactured by the same person, the labeling of which contains the same claims, and the labels of which bear a designation identifying the product

as the same agricultural chemical may be registered as a single product; additional names and labels shall be added by supplement statements during the current period of registration;

(2) within the discretion of the secretary, or his authorized representative, a change in the labeling or formulas of an agricultural chemical may be made within the current period of registration, without requiring a reregistration of the product;

(3) any agricultural chemical imported into this state, which is subject to the provisions of any federal act providing for the registration and which has been duly registered under the provisions of said act, may, in the discretion of the secretary, be exempted from registration under this act, when sold or distributed in the unbroken immediate container in which it was originally shipped.

(*b*) The registrant shall file with the secretary, a statement including:

(1) The name and address of the registrant and the name and address of the person whose name will appear on the label, if other than the registrant;

(2) the name of the agricultural chemical;

(3) a complete copy of the labeling accompanying the agricultural chemical and a statement of all claims made and to be made for it and a statement of directions for use; and

(4) if requested by the secretary, or his authorized representative, a full description of the tests made and the results thereof upon which the claims are based. In the case of renewal of registration, a statement shall be required only with respect to information which is different from that furnished when the product was registered or last reregistered.

(*c*) The registrant shall pay an annual fee of fifteen dollars for each agricultural chemical registered, such fee to be deposited to the credit of a special fund to be used for carrying out the provisions of this act: *Provided, however,* That any registrant may register annually any number of brands after the payment of annual fees aggregating one hundred fifty dollars, by paying an annual fee of five dollars for each agricultural chemical submitted for registration, in excess of the first ten: *Provided further,* That the state board of agriculture is hereby authorized and empowered, whenever it shall determine that the fees and charges provided by this subsection and paid into the state treasury as provided by law, are yielding more revenue than is required for the purposes to which such fees and charges are devoted by law, to reduce such fees and charges for such period as said board shall deem justified, but not less than one (1) year; and in the event that said board, after reducing any such fees or charges, finds that sufficient revenues are not being produced by such reduced fees and charges, said board is authorized and empowered to restore in full or in part said fees and charges, or any of them, to such rates as will, in its judgment, produce sufficient revenues for the purposes as provided in this section, but not exceeding those hereinbefore provided.

(*d*) The secretary, or his authorized representative, whenever it is deemed essential in the administration of this act, may require the submission of the complete formula of any agricultural chemical. If it appears to the secretary, or his authorized representative, that the composition of the article is such as

to warrant the proposed claims for it and if the product and its labeling and other material required to be submitted comply with the requirements of this act, he shall register the product.

(*e*) If it does not appear to the secretary, or his authorized representative, that the product is such as to warrant the proposed claims for it or if the product and its labeling and other material required to be submitted do not comply with the provisions of this act, he shall notify the registrant of the manner in which the product, labeling, or other material required to be submitted fail to comply with the act so as to afford the registrant an opportunity to make the necessary corrections.

(*f*) In order to protect the public, the secretary, or his duly authorized representative, on his own motion, may at any time, after written notice to the registrant, cancel the registration of an agricultural chemical: *Provided,* Any person so notified, shall be given an opportunity to present his views, either orally or in writing, with regard to the secretary's contemplated action, before any registration is canceled or revoked.

(*g*) Notwithstanding any other provisions of this act, registration is not required in the case of an agricultural chemical shipped from one plant within this state to another plant within this state operated by the same person.

SEC. 5. *Determinations; rules and regulations; uniformity.* (*a*) The secretary is authorized, after opportunity for a hearing

(1) to declare as a pest any form of plant or animal life or virus which is injurious to plants, men, domestic animals, articles, or substances;

(2) to determine whether agricultural chemicals are highly toxic to man;

(3) to determine standards of coloring or discoloring for agricultural chemicals; and

(4) to subject agricultural chemicals to the requirements of section 3 (*a*) (6) of this act.

(*b*) The secretary is authorized, after due public hearing, to make appropriate rules and regulations for carrying out the provisions of this act, including rules and regulations providing for the collection and examination of samples of agricultural chemicals.

(*c*) In order to avoid confusion endangering the public health and safety resulting from diverse requirements, particularly as to the labeling and coloring of agricultural chemicals and to avoid increased costs to the people of this state due to the necessity of complying with such diverse requirements in the manufacture and sale of such products, it is desirable that there should be uniformity between the requirements of the several states and the federal government relating to such products. To this end the secretary is authorized, after due public hearing, to adopt regulations, applicable to and in conformity with the primary standards established by this act; or as have or may be prescribed by the United States department of agriculture with respect to agricultural chemicals or economic poisons.

SEC. 6. *Enforcement.* (*a*) The examination of agricultural chemicals shall be made under the direction of the secretary, or his authorized representative, for the purpose of determining whether they comply with the requirements of this act. If it shall appear from such examination that an agricultural chemical fails to comply with the provisions of this act, and the secretary, or his author-

ized representative, contemplates instituting criminal proceedings against any person, he shall cause notice to be given to such person. Any person so notified shall be given an opportunity to present his views, either orally or in writing, with regard to such contemplated proceedings and if thereafter in the opinion of the secretary, or his authorized representative, it shall appear that the provisions of the act have been violated by such person, then the secretary or his authorized representative may refer the facts to the county attorney for the county in which the violation shall have occurred with a copy of the results of the analysis or the examination of such article: *Provided, however,* That nothing in this act shall be construed as requiring the secretary or his representative to report for prosecution or for the institution of libel proceedings minor violations of the act whenever he believes that the public interests will be best served by a suitable notice of warning in writing.

(*b*) It shall be the duty of each county attorney to whom any such violation is reported to cause appropriate proceedings to be instituted and prosecuted in a court of competent jurisdiction without delay.

(*c*) The secretary, or his authorized representative, are authorized by publication in such manner as he may prescribe, to give notice of all judgments entered in actions instituted under the authority of this act.

SEC. 7. *Exemptions.* (A) The penalties provided for violation of section 3 (*a*) of this act shall not apply to—

(1) any carrier while engaged in transporting an agricultural chemical within this state, if such carrier shall, upon request, permit the secretary or his designated representative or agent to copy all records showing the transactions in and movement of the products;

(2) public officials of this state and the federal government engaged in the performance of their official duties;

(3) the manufacturer or shipper of an agricultural chemical for experimental use only

(*a*) by or under the supervision of any agency of this state or of the federal government authorized by law to conduct research in the field of agricultural chemicals, or

(*b*) by others if the agricultural chemical is not sold and if the container thereof is plainly and conspicuously marked "for experimental use only not to be sold," together with the manufacturer's name and address: *Provided, however,* That if a written permit has been obtained from the secretary, or his authorized representative, an agricultural chemical may be sold for experiment purposes subject to such restrictions and conditions as may be set forth in the permit.

(B) No article shall be deemed in violation of this act when consigned for export to a foreign country, and when prepared or packed according to the specifications or directions of the purchaser. If not so exported all the provisions of this act shall apply.

(C) This act shall not limit or abridge in any manner the right of any pharmacist registered in the state of Kansas to sell chemicals and drugs in broken packages in compliance with the Kansas pharmacy laws.

SEC. 8. *Penalties.* (*a*) Any person violating section 3 (*a*) (1) of this act shall be guilty of a misdemeanor and upon conviction shall be fined not less than one hundred dollars and not more than five hundred dollars.

(*b*) Any person violating any provisions of this act other than section 3 (*a*) (1) or failing to comply with any of the provisions of this act other than section 3 (*a*) (1) or violating or failing to comply with any rule or regulation adopted under the provisions of this act, shall be guilty of a misdemeanor and upon conviction shall be fined not more than one hundred dollars for the first offense and upon conviction for a subsequent offense shall be fined not less than one hundred dollars or more than five hundred dollars for each subsequent offense: *Provided*, That any offense committed more than five years after a previous conviction shall be considered a first offense. The registration of the article with reference to which the violation occurred shall terminate automatically upon entry of judgment by the court against the violator. An article the registration of which has been terminated may not again be registered unless the article, its labeling, and other material required to be submitted appear to the secretary, or his authorized representative, to comply with all the requirements of this act.

(*c*) Notwithstanding any other provisions of this section, in case any person, with intent to defraud, uses or reveals information relative to formulas of products acquired under authority of section 4 of this act, he shall be fined not more than five hundred dollars or imprisoned for not more than one year or both.

SEC. 9. *Seizures.* (*a*) Any agricultural chemical that is distributed, sold, or offered for sale within this state or delivered for transportation or transported in intrastate commerce or between points within this state through any point outside this state shall be liable to be proceeded against in any court of competent jurisdiction in any county of the state where it may be found and seized for confiscation by process of libel for condemnation:

(1) If it is adulterated or misbranded;

(2) if it has not been registered under the provisions of section 4 of this act;

(3) if it fails to bear on its label the information required by this act;

(4) if it is a white powder agricultural chemical and is not colored as required under this act.

(*b*) If the article is condemned, it shall, after entry of decree, be disposed of by destruction or sale as the court may direct and the proceeds, if such article is sold, less legal costs, shall be paid to the state treasurer: *Provided*, That the article shall not be sold contrary to the provisions of this act: *And provided further*, That upon payment of costs and upon the execution and delivery to the clerk of such court, of a good and sufficient bond to be approved by him, conditioned that the article shall not be disposed of unlawfully, the court may direct that said article be delivered to the owner thereof for relabeling or reprocessing as the case may be.

(*c*) When a degree of condemnation is entered against the article, court costs and fees and storage and other proper expenses shall be awarded against the person, if any, intervening as claimant of the article.

SEC. 10. *Delegation of duties.* All authority vested in the secretary by virtue of the provisions of this act may with like force and effect be executed by such employees of the Kansas state board of agriculture as the secretary may from time to time designate for said purpose.

SEC. 11. *Co-operation.* The secretary is authorized and empowered to cooperate with, and enter into agreements with, any other agency of this state,

the United States department of agriculture, and any other state or agency thereof for the purpose of carrying out the provisions of this act and securing uniformity of regulations.

SEC. 12. All funds received by the secretary of the state board of agriculture under the provisions of this act shall be paid into the state treasury, and placed in a fund to be known as the "agricultural chemical fund." The state auditor is hereby authorized to draw warrants against the fund upon presentation of properly itemized and duly signed vouchers approved by the secretary of the state board of agriculture.

SEC. 13. *Separability.* If any provision of this act is declared unconstitutional, or the applicability thereof to any person or circumstance is held invalid, the constitutionality of the remainder of this act and the applicability thereof to other persons and circumstances shall not be affected thereby.

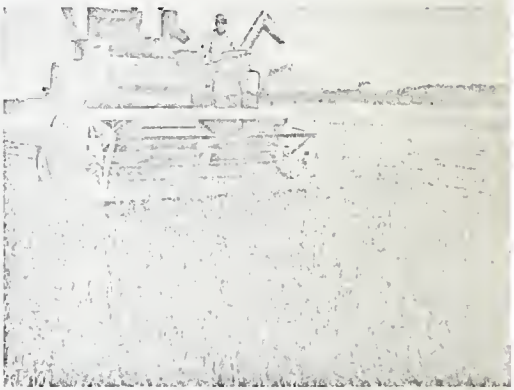
SEC. 14. Jurisdiction in all matters pertaining to the distribution, sale and transportation of agricultural chemicals is by this act vested exclusively in the secretary, and his authorized representative, except as otherwise specifically provided in this act.

SEC. 15. *Appeal from administrative decisions.* In addition to any other remedy which may be available, any person, firm, corporation or association considering himself or itself aggrieved by any act or order of the secretary under this act may, within thirty days from the entry of the order complained of, or within sixty days of the act complained of, if there is no order, take an appeal to the district court of the county in which the party appealing resides, or has his principal place of business, or if a nonresident of the state, to the district court of the county where he maintains his principal place of business in this state, or if he has no place of business within this state, then to the district court of Shawnee county. Such appeal shall be taken by serving upon the secretary a written notice of the appeal and a demand in writing for a certified transcript of all papers on file in its office affecting or relating to such order or act complained of. Such appeal shall be perfected by filing with the clerk of the district court, a copy of the notice of appeal together with proof of service. The court shall hear the appeal *de novo* as in equity and without a jury and shall render judgment and apportion costs in such manner as may be equitable. On such appeal, the record, transcript, evidence, findings and order of the secretary shall be admissible as evidence, and the burden of proof upon a review of the findings of the secretary shall be upon the party taking the appeal.

APPENDIX F

IMC
COMPUTERIZED
WEED CONTROL PROGRAM
FOR CORN AND SOYBEANS

1968 PLANTING SEASON



INDIVIDUALLY
PREPARED FOR: NAME _____

CITY _____ COUNTY _____

STATE _____ (1-50) _____ | | | 51 52

TOTAL NUMBER OF
RECOMMENDATIONS DESIRED _____ | | | 53 54

INTERNATIONAL MINERALS & CHEMICAL CORPORATION
OLD ORCHARD ROAD • SKOKIE, ILLINOIS 60076

ATT: COMPUTERIZED CROP PROTECTION

COMPUTER ASSISTANCE IN CHOOSING THE BEST METHOD FOR WEED CONTROL IN CORN AND SOYBEANS

IMC designed this program to help cornbelt farmers achieve maximum results and profits from chemical and cultural weed control practices.

IMC developed and tested this program with the help of leading weed control authorities at several cornbelt agricultural universities. It is the first time the computer has been used effectively for weed control. International Minerals & Chemical Corporation presents it to you as another service in a continuing program of providing new ways for you to realize maximum returns from your investment in all of your crop production inputs.

It takes advantage of the computer's capacity to balance and interrelate the many factors which must be considered in deciding which chemical, which rate and time of application are best. It also takes into consideration the *other* chemical and/or cultural practices which may be necessary for satisfactory control of certain weed species.

INSTRUCTIONS

FOR COMPLETING INPUT DATA FORM

1. This "Decision Assistance" program is designed to handle *only* those fields in which CORN or SOYBEANS will be planted in 1968.

2. Complete a *separate* form for each field in which broadleaf and/or grassy weeds have been a problem.

3. Please PRINT your name and address on each form submitted.

4. Indicate for each form, *your* Field Number designation. Use no more than two digits or letters per field.

5. Each question must be answered, with *only one* box checked per question.

6. Do not write or mark in the shaded portions.

IMC's Computerized Weed Control Program is a part of the M.O.R.E.* Profit Program, a service designed to help individual farmers optimize their profits from farming operations.

---

*Mathematically Optimized Resource Employment

ROPPING PLANS
ND FIELD CONDITIONS

FIELD NUMBER _____ 172 [ ][ ] (1 2)

ACRES IN FIELD _____ [ ][ ][ ] (3 4 5)

PLEASE ONE ANSWER ONLY FOR EACH QUESTION

In 1968 this field will be planted to:

(1) ☐ Corn
(2) ☐ Soybeans
(3) ☐ Uncertain, consider both

[ ] 6

Which of the following will likely be planted in this field next year (1969)?

(1) ☐ Corn or Sorghum
(2) ☐ Soybeans
(3) ☐ Small Grains
(4) ☐ Any other crop

[ ] 7

I. If soybeans are grown in this field in 1968, what will the crop be used for?

(1) ☐ Food, feed or oil
(2) ☐ Seed for planting
(3) ☐ Soybean will *NOT* be grown

[ ] 8

I. What is the organic matter content of the majority of soils in this field?

(1) ☐ Less than 2%
(2) ☐ 2% to 5%
(3) ☐ 5% to 15%
(4) ☐ Above 15%, including Peat or Muck

[ ] 9

I. What is the texture of the majority of soils in this field?

(1) ☐ Sand and Sandy Loam
(2) ☐ Loam and Silt Loams
(3) ☐ Silty Clay Loam and Clay Loams
(4) ☐ Clays
(5) ☐ Organic (applicable only to Peat or Muck soils)

[ ] 10

II. Was this field fall-plowed?

(1) ☐ Yes
(2) ☐ No

[ ] 11

III. Can this field be disked at least one time between plowing and planting?

(1) ☐ Yes
(2) ☐ No

[ ] 12

DIAGNOSIS OF WEEDS IN THIS FIELD

✓ CHECK ONE ANSWER (ONLY) FOR EACH WEED SHOWN

PERENNIAL GRASSES

Indicate for each the severity or degree of infestation in this field:

QUACKGRASS

(1) ☐ None or Light
(2) ☐ Moderate
(3) ☐ Heavy

☐ 13

JOHNSONGRASS

(1) ☐ None or Light
(2) ☐ Moderate to Heavy

☐ 14

NUTSEDGE

(1) ☐ None or Light
(2) ☐ Moderate to Heavy

☐ 15

ANNUAL GRASSES

Indicate for each the severity or degree of infestation in this field:

WILD CANE

(1) ☐ None or Slight
(2) ☐ Moderate to Heavy

☐ 16

ANNUAL GRASSES (CON'T) Indicate for each the severity or degree of infestation in this field:

GIANT FOXTAIL

(1) ☐ None or Slight
(2) ☐ Moderate to Heavy

☐ 17

OTHER ANNUAL GRASSES

(1) ☐ None or Slight
(2) ☐ Moderate to Heavy

☐ 18

PERENNIAL BROADLEAF WEEDS Indicate for each the severity or degree of infestation in this field:

CANADA OR SOW THISTLE

(1) ☐ None or Light
(2) ☐ Moderate to Heavy

☐ 19

FIELD BINDWEED

(1) ☐ None or Light
(2) ☐ Moderate to Heavy

☐ 20

PERENNIAL BROADLEAF WEEDS (CON'T) Indicate for each the severity or degree of infestation in this field:

WILD SWEET POTATO

(1) ☐ None or Light
(2) ☐ Moderate to Heavy

21 ☐

OTHER PERENNIAL BROADLEAVES

(1) ☐ None or Light
(2) ☐ Moderate to Heavy

22 ☐

ANNUAL BROADLEAF WEEDS Indicate the extent to which you anticipate each of the following annual broadleaved weeds will be a problem in this field in 1968. Consider past history of the field.

PIGWEED

(1) ☐ None or Slight
(2) ☐ Moderate
(3) ☐ Heavy

23 ☐

RAGWEED

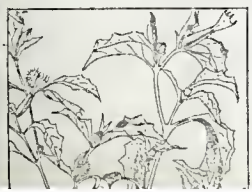
(1) ☐ None or Slight
(2) ☐ Moderate
(3) ☐ Heavy

24 ☐

VELVETLEAF

(1) ☐ None or Slight
(2) ☐ Moderate
(3) ☐ Heavy

25 ☐



JIMSONWEED

(1) ☐ None or Slight
(2) ☐ Moderate
(3) ☐ Heavy

26 ☐

ANNUAL BROADLEAF WEEDS (CON'T)

Indicate the extent to which you anticipate each of the following annual broadleaved weeds will be a problem in this field in 1968. Consider past history of the field.

COCKLEBUR

(1) ☐ None or Slight
(2) ☐ Moderate
(3) ☐ Heavy

☐ 27

LAMBSQUARTER

(1) ☐ None or Slight
(2) ☐ Moderate
(3) ☐ Heavy

☐ 28

SMARTWEED

(1) ☐ None or Slight
(2) ☐ Moderate
(3) ☐ Heavy

☐ 29

ANNUAL MORNING-GLORY

(1) ☐ None or Slight
(2) ☐ Moderate
(3) ☐ Heavy

☐ 30

MUSTARD

(1) ☐ None or Slight
(2) ☐ Moderate
(3) ☐ Heavy

☐ 31

SUNFLOWER

(1) ☐ None or Slight
(2) ☐ Moderate
(3) ☐ Heavy

☐ 32

(CONTINUED ON BACK PAGE)

ANNUAL BROADLEAF WEEDS (CON'T) Indicate the extent to which you anticipate each of the following annual broadleaved weeds will be a problem in this field in 1968. Consider past history of the field.

WILD BUCKWHEAT

(1) ☐ None or Slight
(2) ☐ Moderate
(3) ☐ Heavy

☐ 33

WILD CUCUMBER

(1) ☐ None or Slight
(2) ☐ Moderate
(3) ☐ Heavy

☐ 34

OTHER ANNUAL BROADLEAVES

(1) ☐ None or Slight
(2) ☐ Moderate
(3) ☐ Heavy

☐ 35

IMC REPRESENTATIVE_____(1-20)

STREET_____CITY_____(21-35)

STATE_____ZIP COOE_____(36-50)

OATE_____(51-60)

FORTHCOMING RECOMMENDATIONS WILL REFLECT AN ACCURATE ANO THOROUGH ANALYSIS OF INFORMATION CONTAINEO ON THIS FORM. HOWEVER, DUE TO FACTORS BEYONO THE CONTROL OF INTERNATIONAL MINERALS & CHEMICAL CORPORATION, NO GUARANTEE OF RESULTS CAN BE EXPRESSED OR IMPLIED.

IMC INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Litho in U.S.A.

A WEED CONTROL SOURCE UNIT

by

ALLAN CHARLES ELSTROM
B. S., Kansas State University, 1964

AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1968

ABSTRACT

The main purpose of this study was to evaluate source material and to develop a weed control source unit for agronomic crops in prepared lesson plans that might be used by vocational agricultural teachers in preparing and teaching lessons on weed control.

A source unit, for the purpose of this study, was interpreted as a collection of subject material pertaining to weed control and presented in lessons that could serve as a short-time teaching plan for Kansas vocational agricultural teachers in teaching vocational agriculture classes and/or adult farmer classes. The source unit was designed to be accumulative in nature, with new material being added as new ideas and information became available. The source unit was also designed to contain more information than most vocational agricultural teachers would want to use in one class. The following procedures were used:

1. Names of weeds that were very harmful in agronomic crops were obtained.
2. Information for developing this source unit was obtained from technical publications, text books, magazines, and by interviews.
3. The above material and interviews were reviewed. Selections from the material and interviews were made on their potential usefulness in helping

Kansas vocational agricultural teachers teach lessons on weed control.

4. A tentative source unit was developed.
5. The tentative source unit was submitted to an advisory committee of two specialists. One reviewed the source unit from the standpoint of its organization and its value in meeting the needs of vocational agricultural teachers and one reviewed the source unit from the standpoint of its technical information.
6. The source unit was then revised on the basis of suggestions made by the advisory committee.
7. A tentative multiple choice 100 question examination, based on the material in the source unit, was developed. This examination was reviewed by three specialists. No major revisions were made from the tentative examination.

Another purpose of this study was to evaluate the effectiveness of the source unit. The usefulness of the material in the source unit was evaluated by a comparison of pre-test and post-test scores taken in connection with the teaching of lessons from the unit to Jewell High School vocational agriculture students. These students were divided into two groups. The freshmen and seniors were the control group and the sophomores and juniors were the experimental group.

The pre-test was given to all the students. The source unit was taught to the experimental group and then all the students took the test again. The results of the pre-test and the post-test were analyzed.

The findings showed that those students who received instruction from the source unit increased their scores from the pre-test to the post-test by 90.90 percent. Those students not having any instruction from the source unit increased their scores by 2.10 percent. There was a total difference of 88.80 percent between the experimental group and the control group.